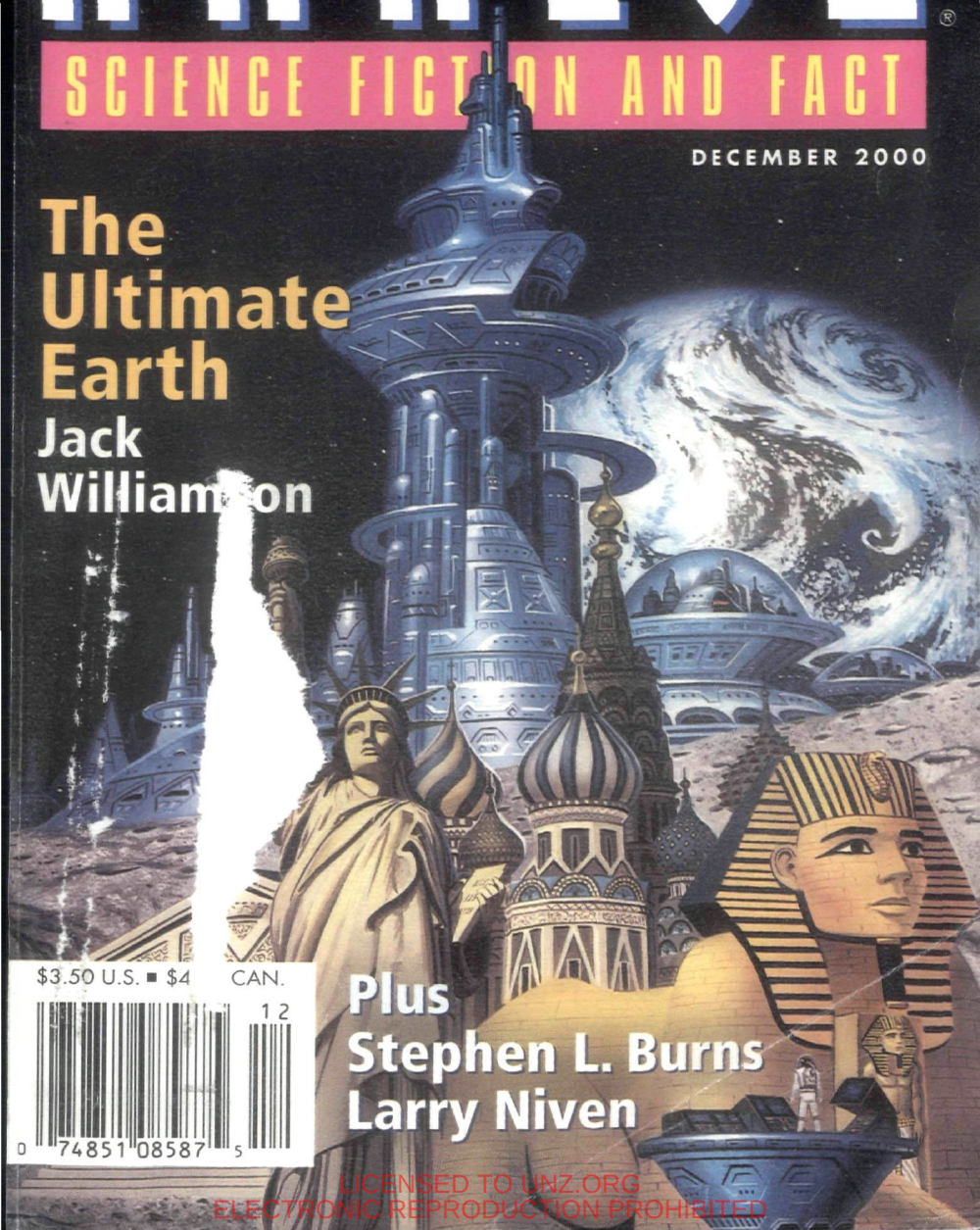
ANALOG

SCIENCE FICTION AND FACT

DECEMBER 2000

The Ultimate Earth

Jack Williamson



Plus
Stephen L. Burns
Larry Niven

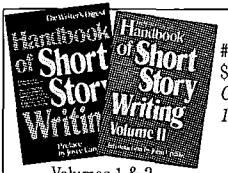
$3.50 U.S. ■ $4 CAN.

12

0 74851 08587 5

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

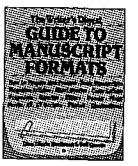
#10501 $19.99 #10518 $14.99 #10464 $22.99 #48041 $18.99 #43102 $55.96 *Counts as 1 selection.*



#43057 $27.98 pbs *Counts as 1 selection.*

Volumes 1 & 2

#10366 $17.99

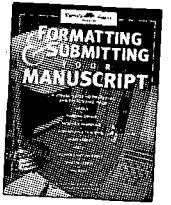


#10025 $19.99

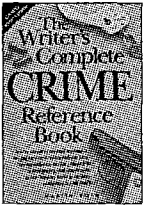
#10532 $17.99

#10541 $19.99

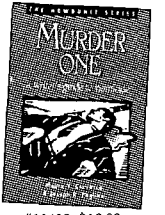
#10567 $17.99



#10618 $18.99



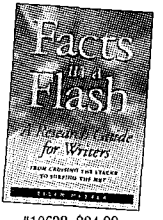
#10371 $19.99



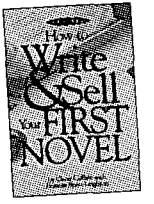
#10498 $16.99

#10500 $22.99

#48030 $17.99

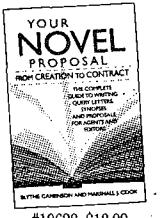


#10632 $24.99



#10530 $16.99

#10631 $18.99



#10628 $18.99

AS A CLUB MEMBER, YOU'LL ENJOY:

- **DISCOUNTS FROM 15-65%** on every book you buy!
- **FREE SHIPPING AND HANDLING** on prepaid orders (after this joining offer)!
- **SATISFACTION GUARANTEED 100%!**

HOW THE CLUB WORKS

You'll receive the *BULLETIN* every four weeks (fourteen times a year) featuring the Main Selection and 100 or more of the newest and best books for writers. If you want the Main Selection, do nothing. We will send it to you automatically. If you want a different book or want nothing that month, just indicate your choice on the easy-to-use Selection Card and mail it to us. You'll always have at least 10 days to decide and return your Selection Card. However, if late mail delivery ever causes you to receive a book you don't want, you may return it at Club expense. As a new member, you are under no obligation to buy any more books—you're just trying out the Club for 9 months. After that, you may cancel at any time. Every time you buy a book from the *BULLETIN*, your membership will be renewed for 6 months from the purchase date.

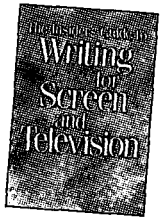
LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

TAKE 2 BOOKS

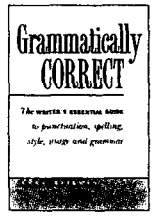
FREE*

WITH A 3RD FOR JUST $11.99 WHEN YOU JOIN WRITER'S DIGEST BOOK CLUB!

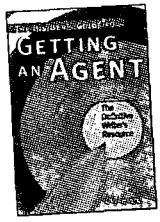
10602 $18.99



#10483 $17.99



#10529 $19.99



#10630 $16.99

#10553 $18.99

MEMBERSHIP SAVINGS CERTIFICATE

☐ YES! I want to join Writer's Digest Book Club. Please sign me up and send me:

My first FREE book #_____	FREE
and my second FREE book #_____	FREE
with my third book #_____ for only	$ 11.99
*plus shipping and handling	$ 6.53
all for just	$ 18.52

(Payment in U.S. funds must accompany order. In Ohio add 72¢ tax. In Canada, please provide a street address and enclose $8.93 for shipping and handling plus $1.46 for GST for a total of $22.38.)

☐ Check enclosed or Charge my ☐ VISA ☐ MasterCard

Acct # | | | | | | | | | | | | | | | | Exp. Date: _____

I have read How The Club Works and understand I have no obligation to buy any more books.

Signature_____
required on all certificates

Name_____

Address_____

City_____ State/Prov. _____ ZIP/PC_____

Writer's Digest BOOK CLUB

Limited time offer good for new members in the U.S. and Canada only. Please allow 3-4 weeks for delivery. All applications subject to approval.

AN77

P.O. Box 12948 Cincinnati, Ohio 45212-0948

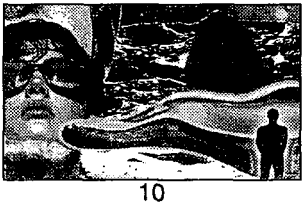
LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ANALOG

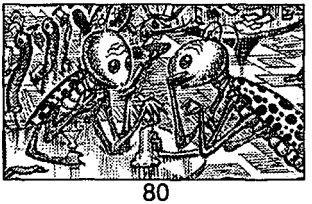
SCIENCE FICTION AND FACT

Vol.CXX No. 12
December 2000

Next Issue on Sale
November 21, 2000



10



80

NOVELLA

THE ULTIMATE EARTH, Jack Williamson ____ 10

NOVELETTES

SNOWBALL IN HELL, Brian Stableford ____ 50
AMONG THE WILD CYBERS OF CYBELE, Christopher L. Bennett ____ 90
EDEN TAG, Stephen L. Burns ____ 108

SHORT STORIES

IT'S THE THOUGHT THAT COUNTS, Jerry Oltion ____ 74
THE MISSING MASS, Larry Niven ____ 80

SCIENCE FACT

SUMMER'S LEASE, J.R. Dunn ____ 42

PROBABILITY ZERO

THE MAN WHO BROUGHT DOWN THE NEW YORK TIMES, Paul Levinson ____ 78

READER'S DEPARTMENTS

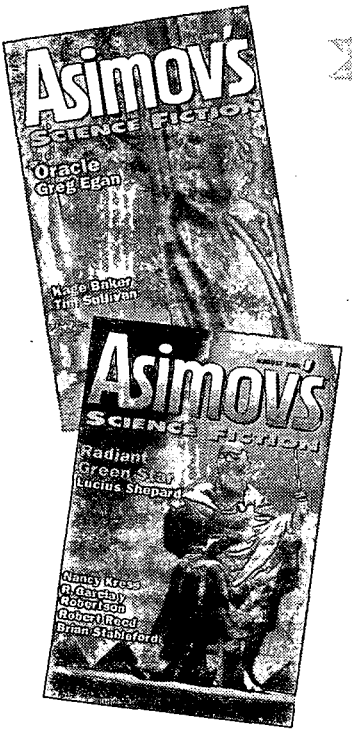
THE EDITOR'S PAGE ____ 4
IN TIMES TO COME ____ 9
THE ALTERNATE VIEW, Jeffery D. Kooistra ____ 71
THE REFERENCE LIBRARY, Tom Easton ____ 132
BRASS TACKS ____ 138
UPCOMING EVENTS, Anthony Lewis ____ 144

Stanley Schmidt *Editor*
Cover design by Victoria Green
Indicia on Page 5

Trevor Quachri *Assistant Editor*
Cover Art by Alan Gutierrez
Online Chat Listing on Page 40

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

DISCOUNT TIME TRAVEL



Just $6.95!
For 5 Classic Issues

You'll join the vanguard of science fiction when you order our *Asimov's Science Fiction Value Pack*. You get five of our most popular back issues for just $6.95 plus shipping. *That's a savings of 60% off the regular price!*

Asimov's always delivers the most celebrated authors in the field. Share their visions now with dozens of stories that launch you into the fantastic worlds of tomorrow.

To get your *Asimov's Science Fiction Value Pack*, just complete the order form below and mail it back to us with your payment today.

PENNY MARKETING
Dept. SM-100, 6 Prowitt Street, Norwalk, CT 06855-1220

☑ YES! Please send me my **Asimov's Science Fiction Value Pack**. I get 5 back issues for just $6.95 plus $2 shipping and handling ($8.95 per pack, U.S. funds). **My satisfaction is fully guaranteed!** My payment of $_____ is enclosed. (IAPK05)

Name: _____
(Please print)

Address: _____

City: _____

State: _____ **ZIP:** _____

Please make checks payable to Penny Marketing. Allow 8 weeks for delivery. Magazines are back issues shipped together in one package. To keep prices low we cannot make custom orders. Add $4 additional postage for delivery outside the U.S.A. Offer expires 12/31/01. 090C-NN5VL1

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

EDITORIAL Stanley Schmidt

CHILD'S PLAY

Zoologists and behavioral psychologists have long known that play is an important element of the education of animals with long childhoods, helping them lay the foundations of such soon-to-be-vital skills as hunting, flying, and social interaction. In practice, "animals with long childhoods" means some birds and at least most mammals—which, of course, includes us.

The more complicated such animals' societies are, the more they're likely to progressively modify the nature of their behavior patterns and institutions—including play. Humans do more of this than anyone else, and their modifications can be so conscious and drastic that from time to time it's a good idea to take a look at whether our new ways are still serving their original purposes. What better time than December—what Lucy Van Pelt calls "the gift-getting season"—to reflect thus on how well our current versions of child's play are serving us? (And no, I'm not talking, at least primarily, about the fashion for overtly and premeditatedly "educational" toys.)

One particular aspect of this question occurred to me during a conversation overheard in a Wendy's restaurant, between two gentlemen of more or less advanced years reminiscing about things they used to play with. One of them said something like, "Isn't it just amazing, some of the things that we used to play with and nobody thought a thing about it? Air rifles*, bows and arrows . . . Kids wouldn't be allowed to have things like that now. Somebody might get hurt!"

I hadn't really thought about it lately, much less toured a large toy store to see whether those items really *had* disappeared; but it sounded eminently plausible, in view of the current mania for Absolute Safety in All Possible Things. And if it *was* true, the question that sprang to mind was: Is this a good thing? Or might moderately dangerous toys *as such* serve some important educational purpose that was not being served for today's children?

That seemed to me quite likely; and yes, of course I'll tell you what purpose I had in mind, in good time. Before I could even know whether the notion was worth pursuing, though, I had to spend some time browsing in a toy store to see whether the overheard oldtimers' claim had any merit. So I did.

Now, I did not read the fine print on every box (this was a *big* store), or grill the manager about what I could or could not special-order. But I did make a pretty careful scan of all the aisles, and I think I got a good feel for the major categories of what was available, and a lot of the specifics. And I did not see any air rifles or pistols, archery sets, or lawn

*For purists, I note that most of the things colloquially called "air guns" really aren't, but use a spring propulsion system instead. But the terminology has been established for a long time; if it bothers you, feel free to read it as "BB guns."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

darts (or darts of *any* sort, for that matter). Nor could I remember any recent instances of seeing these things in use—or rather, I could remember *one* time when I saw a kid in a yard with an air rifle, and that stood out as something that had become very unusual.

"Great!" I hear some of you saying. "Kids shouldn't be playing with guns or weapons anyway! It's about time we got them out of the toy stores!"

Ah, but there was no shortage of guns or weapons. Long expanses of aisles were brimming with "light sabers" and other "futuristic" weapons spun off from heavily promoted movies and television series, generic light guns, water guns, and a veritable smorgasbord of rubber and plastic guns, swords, and spears. To say nothing of lots and lots of "action figures" and war games (futuristic and otherwise), ranging from board games to "virtual reality simulation" games incorporating computer power that the biggest research labs could only dream about just a couple of decades ago.

All of it perfectly, calculatedly harmless.

What was lacking—and I submit that it may be a serious lack—is any toy of a weaponlike character that *could* hurt anybody, even slightly. What's wrong with that, you may ask? What's wrong is that, if play really does serve to lay the foundation for skills and attitudes, play with these things has the potential to inculcate dangerously wrong attitudes toward weapons and dangerous tools. Hours of simulated play with games in which people have fun going through the motions of killing without having any real effect on anyone or anything seem ready-made to condition the players to think (1) "This stuff is cool!" and (2) "It doesn't matter how much of it I do because none of it has any real effect."

In other words, what's wrong is that playing these games consists of practicing actions that would have very serious consequences in reality, under conditions where they have no consequences whatsoever. One of the most important lessons people need to learn about life is that *actions have consequences*. How are they supposed to learn that if their play is carefully and artificially limited to conditions where their actions *don't* have consequences?

Let me make a heretical countersuggestion: The whole philosophy of toys and play should be rethought so that it deliberately introduces, at appropriate ages and under appropriate supervision, toys and games that *do* have consequences, including the possibility of hurting oneself or others by being careless or inept. This isn't just about weapons, either. A great many of the tools people use as adults can do serious damage if they're not used carefully and correctly. The toy store I toured had several child-sized tool kits, but very few that could actually drive a nail or bruise a thumb. It should have had more. It

Analog Science Fiction and Fact (Astounding) USPS 488-910 is published monthly except for a combined July/August double issue by Dell Magazines, a division of Crosstown Publications. One-year subscription for $39.97 in the U.S.A. and possessions, in all other countries, $47.97 (GST included in Canada, GST # 123054108) payable in advance in U.S. funds. First copy of new subscription will be mailed within eight weeks of receipt of order. When reporting change of address allow 6 to 8 weeks and give new address as well as the old address as it appears on the last label. Periodical postage paid at Norwalk, CT and additional mailing offices. Canadian postage paid at Montreal, Quebec. Canada Post International Publications Mail, Product Sales Agreement No. 260622. © 2000 by Dell Magazines, a division of Crosstown Publications, all rights reserved. Protection secured under the Universal Copyright Convention. Reproduction or use of editorial or pictorial content in any manner without express permission is prohibited. All stories in this magazine are fiction. No actual persons are designated by name or character. Any similarity is coincidental. All submissions must be accompanied by stamped self-addressed envelope, the publisher assumes no responsibility for unsolicited manuscripts or artwork. ISSN 1059-2113

POSTMASTER: Send change of address to: ANALOG SCIENCE FICTION AND FACT
P.O. Box 54625, Boulder, CO 80328-4625.

IN CANADA RETURN TO: Transcontinental Sub Dept, 525 Louis Pasteur, Boucherville, Quebec, J4B 8E7
Executive Office: Penny Press, 6 Prowitt St., Norwalk, CT 06855
Editorial and Advertising: Analog Science Fiction and Fact, 475 Park Avenue South, New York, N.Y. 10016
Subscriptions: Analog Science Fiction and Fact, P.O. Box 54027, Boulder, CO 80322-4027

Printed in Canada

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

seems self-evident to me that an appropriate way to prepare children to use dangerous things responsibly is to let them practice early with things that are a *little* bit dangerous. No, I'm not suggesting that we give three-year-olds potentially lethal tools or weapons. But I am suggesting that by the time they're, say, ten or twelve, they should use some things that can produce memorable episodes of real discomfort, and maybe even require the occasional heavy-duty Band-Aid.

Naturally they should not simply be turned loose with such things, with no instruction in how to use them safely or what responsibility they bear for any consequence of misuse. But once they've demonstrated competence under close supervision, they should be allowed—even required—to do so with progressively *less* oversight, and made to accept responsibility for whatever happens. If a kid hurts himself with a target pistol or a saw that actually cuts, don't soothe him and tell him you'll sue that nasty ol' manufacturer—point out how he should have been more careful, and give him some time off to think about it. If he breaks a neighbor's window, make *him* pay for it, along with such other punishments as seem appropriate. Some parents may be so intent on protecting their children from temporary physical or fiscal injury that they cripple them forever psychologically.

The only way to teach people the essential principle that actions have consequences is to let them do things that *do* have consequences, and make them live with those consequences.

Target shooting, whether with rifle, pistol, or bow, is still a good way to do that. Shooting a target shows enough of what a gun or bow can do to drive home the point that you really do have to be careful where you point it—unlike any of the totally imaginary games now filling our toy stores. Naturally, with younger kids, you'd start with things like pop guns that shoot something soft a short distance, and progress gradually toward more seriously dangerous things like BB guns and .22 caliber rifles, not letting anyone go the next step until they've demonstrated both skill and judgment that make it reasonably safe. It still won't be *perfectly* safe, of course, but hardly anything is, in the real world—and that's an important lesson, too.

But . . . *guns*, you say? How can you even suggest such a thing with all the violence in our society today? Especially

STANLEY SCHMIDT .....Editor
SHEILA WILLIAMS .....Managing Editor
TREVOR QUACHRI .....Assistant Editor
LEAH MARCUS.....Editorial Assistant
LINDA LEE WHITE.....Editorial Assistant
VICTORIA GREEN .....Senior Art Director
JUNE LEVINE.....Assistant Art Director
CAROLE DIXON.....Senior Production Manager
ABIGAIL BROWNING.....Manager, Subsidiary Rights and Marketing
SCOTT LAIS.....Contracts and Permissions
JULIA McEVOY .....Manager, Advertising Sales
BRUCE W. SHERBOW.....VP, Sales and Marketing
SANDY MARLOWE .....Circulation Services

PETER KANTER
Publisher

CHRISTINE BEGLEY
Associate Publisher

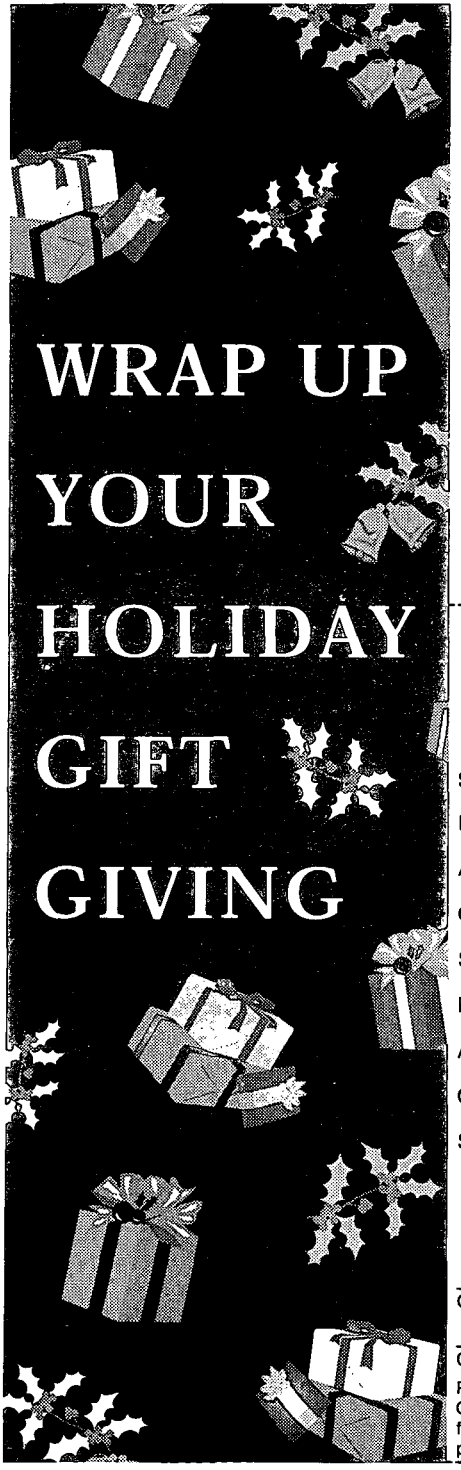
SUSAN KENDRIOSKI
Executive Director, Art & Production

Published since 1930

First issue of *Astounding* January 1930 ©

ADVERTISING REPRESENTATIVE David Geller Publishers' Rep. (212) 455-0100
EDITORIAL CORRESPONDENCE ONLY analog@dellmagazines.com

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED



This holiday season give a gift the science fiction fans on your shopping list will enjoy all year - a subscription to

Analog Science Fiction and Fact!

Each issue is filled with page after page of fascinating stories and articles for a whole year of entertainment.

A one-year gift subscription is only $29.97 - *you'll save more than 25% off the regular price!*

To charge your order by phone, call **toll-free 1-800-333-4561**
or complete the coupon below and mail to:
Analog Science Fiction and Fact
P.O. Box 54027, Boulder, CO 80322-4027

Send gift to:

Name_____

Address_____

City_____

State_____ ZIP_____

My name:_____

Address_____

City_____

State_____ ZIP_____

12 issues (1 full year), $29.97 2X9C

❑ Payment enclosed ❑ Bill me

❑ Charge my ❑ MasterCard ❑ VISA

_____
Card number Exp.

_____
Cardholder's signature

Please allow 6 to 8 weeks for delivery of the first issue. Outside U.S.A., add $8 postage per subscription (U.S. funds only, payable with order). For additional gifts, please use an additional piece of paper.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

after a rash of events like the Columbine High School Massacre?

Well, actually, the Columbine incident may be an argument in *favor* of this sort of thing. Some have speculated that one contributing influence to the Columbine incident may have been the perpetrators' fascination with violent video games, which people who have experienced both say are quite comparable to military desensitization programs designed to reduce soldiers' inhibitions about killing. A hypothesis worth investigating is that the reason both video games and military desensitizers work, at least for some people, is that they provide lots of simulated experience with the methods and feel of killing, and none with its consequences—so the users may lose grasp of the fact that there *are* consequences in reality. Play is a sort of simulation, with or without computers, but the computer kind, even more than the real-world kind, tends to lack real consequences.

Consider, by way of contrast, a farm boy who's been taught to target-shoot responsibly and thinks he's interested in hunting. He's not old enough for a hunting license or to carry a real rifle or shotgun, but he lives in sparsely populated country and goes "hunting" for "pest" birds with a BB gun. That's not a very accurate weapon and he's relatively unlikely to *hit* any birds—but if he ever does, the shock of watching what happens to it may make him *realize* for the first time in his life what a gun really does to living things, and cause him to lose all interest in ever pointing one at something that it could hurt.

Or it may not. Different people react differently to the same stimuli. One kid may be turned off of guns and/or hunting forever by an incident like that; another may get a kick from it and find that it just whets his appetite for more. But wouldn't it be useful to *know* which individuals will react which way, *before* they start shooting fellow humans? Computer simulations may be a potentially useful way to do that. However, I suspect that most people at least dimly sense the difference between a simulation and reality, and there is likely to be a significant difference in emotional reaction between hurting something real and "killing" something in a video arcade. For that matter, people react so differently to existing video games that the link between them and insane mass killings is tenuous at best. Plenty of people play them a lot and wouldn't dream of doing the same things in reality.

Similar points can also be made about people and real guns. At present we are seeing a recognizable epidemic of gun violence, and a reaction in the form of considerable public demand for tight gun controls. Such controls may actually be needed at the moment, to alleviate the symptom—but I'm not sure they would do any more than that. Sometimes aspirin is needed to relieve pain, but surgery is needed to cure the *cause* of pain. As a recent letter to my local paper pointed out, guns were actually more readily available at some times and places in our country's past, yet were less used against people. Our *primary* current problem is not the availability of guns, but the widespread attitude that they're an acceptable way to solve personality problems.

The present mindset, essentially equating "guns" with "murder," actually seems rather odd to someone who grew up in the kind of neighborhood where I spent some of my formative years. Guns were commonplace, but they were for target shooting and hunting; nobody I knew would have ever thought of using them against other people. It's true that easy availability of guns to a population containing a lot of unstable people who can't be trusted to use them responsibly is a dangerous situation. Reducing the availability of guns might reduce the danger somewhat—but reducing the number of people who can't be trusted would be more rewarding. And target shooting, along with other forms of su-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

pervised play with mildly to moderately dangerous "toys," could play a significant role in doing that.

The one big practical problem in implementing that suggestion, of course, is that it requires parents to have a strong sense of responsibility themselves, and many don't. How do you raise a responsible new generation when the older generation, the people who should be teaching them, aren't responsible themselves?

I don't have the answer to that one—but we'd better find one. ■

IN TIMES TO COME

For our first story that *everybody* (who uses the locally prevalent calendar!) can agree belongs to "The New Millennium," G. David Nordley returns to the chaotic moons of the outer Solar System for a new Hartigan O'Reilly mystery (a name that may strike a chord if you remember, for example, "A Calendar of Chaos"). Fraud and murder are complicated enough when people and things are unique, but when technology can duplicate both at will, things get a *lot* more complicated! David Hardy, too long away from *Analog*, returns for the cover.

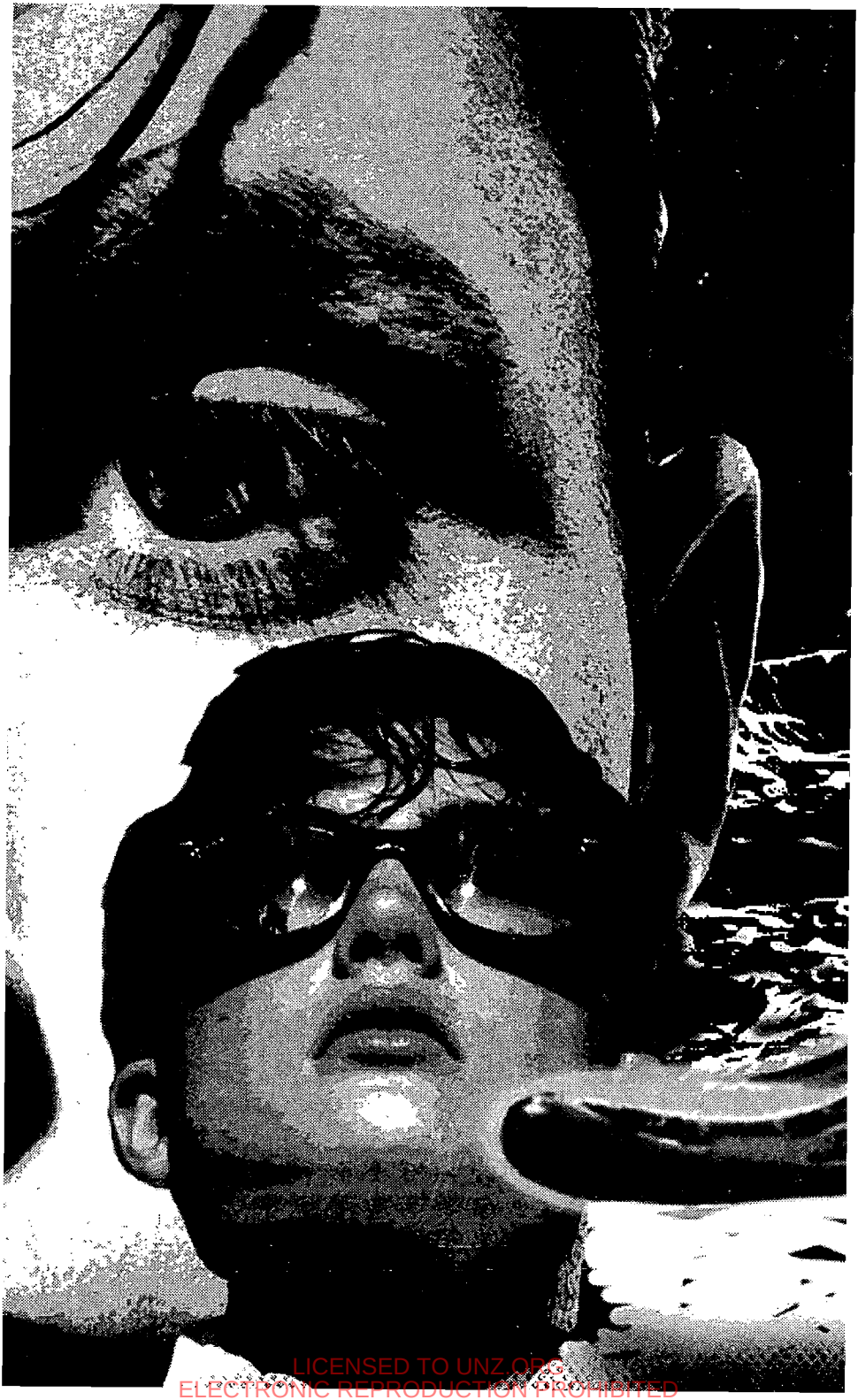
We'll also have the second story of Jack Williamson's "quasi-serial" of a "terraformed" far-future Earth. At this point I would normally reassure you that the two stories are so told that one story is not a prerequisite for the other (though of course if you read both, you'll likely get more than twice as much satisfaction as from reading either alone since the whole really is more than the sum of the parts). That is, as usual, true; but in this case there's no reason for you *not* to read "The Ultimate Earth" before "The Nth Step"; after all, if you're reading this, it's just a few pages away!

We'll also have a new "Knave" story by Laurence M. Janifer, plus stories by George Zebrowski and James Van Pelt. Our science fact article, by Kyle Kirkland, Ph.D., looks at some recent developments in learning how memory works—which, like most research, renders some familiar science-fictional ideas obsolete while suggesting plenty of new ones.

CORRECTION

The cover artist for our September 2000 issue was Kim Poor. We apologize for the error.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED



LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

The Ultimate Earth

Jack Williamson

One of the most characteristic human behaviors is time-binding, but the ways generations are linked can themselves evolve in big ways.

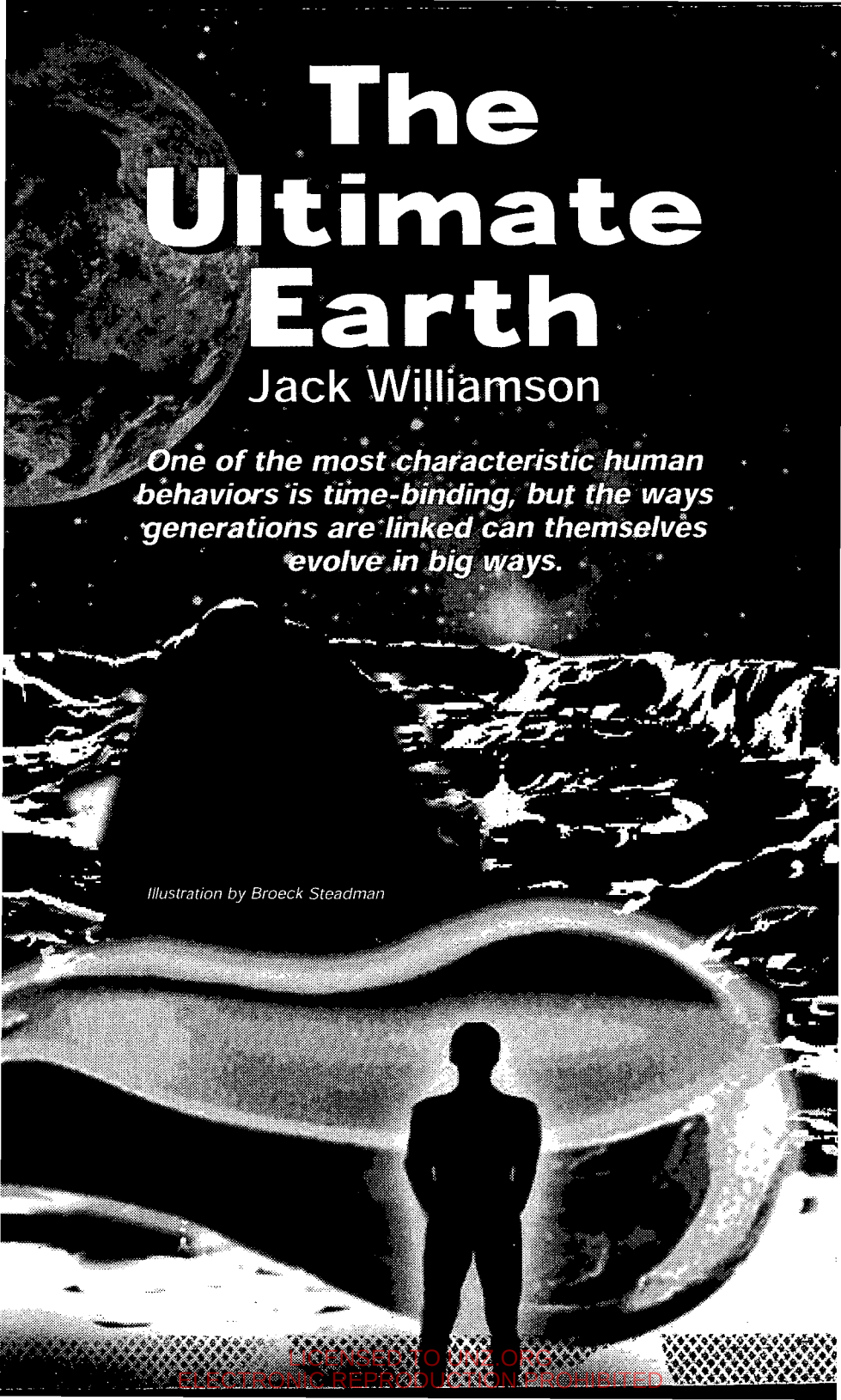


Illustration by Broeck Steadman

LICENSED TO VNO.ORG
ELECTRONIC REPRODUCTION PROHIBITED

1.

We loved Uncle Pen. The name he gave us was too hard for us to say, and we made it Sandor Pen. As early as we could understand, the robots had told us that we were clones, created to watch the skies for danger and rescue Earth from any harm. They had kept us busy with our lessons and our chores and our workouts in the big centrifuge, but life in our little burrow left us little else to do. His visits were our best excitement.

He never told us when he was coming. We used to watch for him, looking from the high dome on the Tycho rim, down across the field of Moondust the digging machines had leveled. Standing huge on the edge of it, they were metal monsters out of space, casting long black shadows across the gray waste of rocks and dust and crater pits.

His visit on our seventh birthday was a wonderful surprise. Tanya saw him landing and called us up to the dome. His ship was a bright teardrop, shining in the black shadow of a gigantic metal insect. He jumped out of it in a sleek silvery suit that fitted like his skin. We waited inside the airlock to watch him peel it off. He was a small lean man, who looked graceful as a girl but still very strong. Even his body was exciting to see, though Dian ran and hid because he looked so strange.

Naked, his body had a light tan that darkened in the sunlit dome and faded fast when he went below. His face was a narrow heart-shape, his golden eyes enormous. Instead of hair like ours, his head was capped with sleek, red-brown fur. He needed no clothing, he told us, because his sex organs were internal.

He called Dian when he missed her, and she crept back to share the gifts he had brought from Earth. There were sweet fruits we had never tasted, strange toys, stranger games that he had to show us how to play. For Tanya and Dian there were dolls that sang strange songs in voices we couldn't understand and played loud music on tiny instruments we had never heard.

The best part was just the visit with him in the dome. Pepe and Casey had eager questions about life on the new Earth. Were there cities? Wild animals? Alien creatures? Did people live in houses, or underground in tunnels like ours? What did he do for a living? Did he have a wife? Children like us?

He wouldn't tell us much. Earth, he said, had changed since our parents knew it. It was now so different that he wouldn't know where to begin, but he let us take turns looking at it through the big telescope. Later, he promised, if he could find space gear to fit us, he would take us up to orbit the Moon and loop toward it for a closer look. Now, however, he was working to learn all he could about the old Earth, the way it had been ages ago, before the great impacts.

He showed it to us in the holo tanks and the brittle old paper books, the way it was with white ice caps over the poles and bare brown deserts on the continents. Terraformed, the new Earth had no deserts and no ice. Under the bright cloud spirals, the land was green where the sun struck it, all the way over the poles. It looked so wonderful that Casey and Pepe begged him to take us back with him to let us see it for ourselves.

"I'm sorry." He shook his neat, fur-crowned head. "Terribly sorry, but you can't even think of a trip to Earth."

We were looking from the dome. Earth stood high in the black north, where it always stood. Low in the west, the slow Sun blazed hot on the new mountains the machines had piled up around the spaceport, and filled the craters with ink.

Dian had learned by now to trust him. She sat on his knee, gazing up in adoration at his quirky face. Tanya stood behind him, playing a little game. She held her hand against his back to bleach the golden tan, and took it away to watch

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

the Sun erase the print.

Looking hurt, Casey asked why we couldn't think of a trip to Earth.

"You aren't like me." That was very true. Casey has a wide black face with narrow Chinese eyes and straight black hair. "And you belong right here."

"I don't look like anybody." Casey shrugged. "Or belong to you."

"Of course you don't." Uncle Pen was gently patient. "But you do belong to the station and your great mission." He looked at me. "Remind him, Dunk."

My clone father was Duncan Yarrow. The master computer that runs the station often spoke with his holo voice. He had told us how we had been cloned again and again from the tissue cells left frozen in the cryostat.

"Sir, that's true." I felt a little afraid of Uncle Pen, but proud of all the station had done. "My holo father has told us how the big impacts killed Earth and killed it again. We have always brought it back to life." My throat felt dry. I had to gulp, but I went on. "If Earth's alive now, that's because of us."

"True. Very true." He nodded, with an odd little smile. "But perhaps you don't know that your little Moon has suffered a heavy impact of his own. If you are alive today, you owe your lives to me."

"To you?" We all stared at him, but Casey was nodding. "To you and the digging machines? I've watched them and wondered what they were digging for. When did that object hit the Moon?"

"¿Quién sabe?" He shrugged at Pepe, imitating the gesture and the voice Pepe had learned from his holo father. "It was long ago. Perhaps a hundred thousand years, perhaps a million. I haven't found a clue."

"The object?" Pepe frowned. "Something hit the station?"

"A narrow miss." Uncle Pen nodded at the great dark pit in the crater rim just west of us. "The ejecta smashed the dome and buried everything. The station was lost and almost forgotten. Only a myth till I happened on it."

"The diggers?" Casey turned to stare down at the landing field where Uncle Pen had left his flyer in the shadows of those great machines and the mountains they had built. "How did you know where to dig?"

"The power plant was still running," Uncle Pen said. "Keeping the computer alive. I was able to detect its metal shielding and then its radiation."

"We thank you." Pepe came gravely to shake his hand. "I'm glad to be alive."

"So am I," Casey said. "If I can get to Earth." He saw Uncle Pen beginning to shake his head, and went on quickly, "Tell us what you know about the Earth impacts and how we came down to terraform the Earth and terraform it again when it was killed again."

"I don't know what you did."

"You have showed us the difference we made," Casey said. "The land is all green now, with no deserts or ice."

"Certainly it has been transformed." Nodding, Uncle Pen stopped to smile at Tanya as she left her game with the sun on his back and came to sit crosslegged at his feet. "Whatever you did was ages ago. Our historians are convinced that we've done more ourselves."

"You changed the Earth?" Casey was disappointed and a little doubtful. "How?"

"We removed undersea ledges and widened straits to reroute the ocean circulation and warm the poles. We diverted rivers to fill new lakes and bring rain to deserts. We engineered new lifeforms that improved the whole biocosm."

"But still you owe us something. We put you there."

"Of course." Uncle Pen shrugged. "Excavating the station, I uncovered evidence that the last impact annihilated life on Earth. The planet had been reseeded sometime before the lunar impact occurred."

"We did it." Casey grinned. "You're

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

lucky we were here."

"Your ship?" Pepe had gone to stand at the edge of the dome, looking down at the monster machines and Uncle Pen's neat little flyer, so different from the rocket spaceplanes we had seen in the old video holos. "Can it go to other planets?"

"It can." He nodded. "The planets of other suns."

Tanya's eyes went wide, and Pepe asked, "How does it fly in space with no rocket engines?"

"It doesn't," he said. "It's called a slider. It slides around space, not through it."

"To the stars?" Tanya whispered. "You've been to other stars?"

"To the planets of other stars." He nodded gravely. "I hope to go again when my work here is finished."

"Across the light-years?" Casey was awed. "How long does it take?"

"No time at all." He smiled at our wonderment. "Not in slider flight. Outside of space-time, there is no time. But there are laws of nature, and time plays tricks that may surprise you. I could fly across a hundred light-years to another star in an instant of my own time and come back in another instant, but two hundred years would pass here on Earth while I was away."

"I didn't know." Tanya's eyes went wider still. "Your friends would all be dead."

"We don't die."

She shrank away as if suddenly afraid of him. Pepe opened his mouth to ask something, and shut it without a word.

He chucked at our startlement. "We've engineered ourselves, you see, more than we've engineered the Earth."

Casey turned to look out across the shadowed craters at the huge globe of Earth, the green Americas blazing on the sunlit face, Europe and Africa only a shadow against the dark. He stood there a long time and came slowly back to stand in front of Uncle Pen.

"I'm going down to see the new Earth when I grow up." His face set stubbornly. "No matter what you say."

"Are you growing wings?" Uncle Pen laughed and reached a golden arm to pat him on the head. "If you didn't know, the impact smashed all your old rocket craft to junk."

He drew quickly back.

"Really, my boy, you do belong here." Seeing his hurt, Uncle Pen spoke more gently. "You were cloned for your work here at the station. A job that ought to make you proud."

Casey made an angry swipe across his eyes with the back of his hand and swallowed hard, but he kept his voice even.

"Maybe so. But where's any danger now?"

Uncle Pen had an odd look. He took a long moment to answer.

"We are not aware of any actual threat from another impacting bolide. All the asteroids that used to approach Earth's orbit have been diverted, most of them steered into the Sun."

"So?" Casey's dark chin had a defiant jut. "Why did you want to dig us up?"

"For history." Uncle Pen looked away from us, up at the huge, far-off Earth. "I hope you're try to understand what that means. The resurfaced Earth had lost nearly every trace of our beginning. Historians were trying to prove that we had evolved on some other planet and migrated here. Tycho Station is proof that Earth is the actual mother world. I've found our roots here under the rubble."

"I guess you can be proud of that," Casey said, "but who needs the station now?"

"Nobody, really." He shrugged, with an odd little twist of his golden lips, and I thought he felt sorry for Casey. "If another disaster did strike the Earth, which isn't likely at all, it could be repeopled by the colonies."

"So you dug us up for nothing?"

"If you knew what I have done," Pen leaned and reached as if to hug him, but he shrank farther away. "It wasn't easy!

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

We've had to invent and improvise. We had to test the tissue cells still preserved in the cryostat, and build new equipment in the maternity lab. A complex system. It had to be tested." He smiled down into Tanya's beaming devotion. "The tests have turned out well."

"So we are just an experiment?"

"Aren't you glad to be alive?"

"Maybe," Casey muttered bitterly. "If I can get off the Moon. I don't want to sit here till I die, waiting for nothing at all?"

Looking uncomfortable, Pen just reached down to lift Tanya up in his arms.

"We were meant for more than that," Casey told him. "I want a life."

"Please, my dear boy, you must try to understand." Patiently, Uncle Pen shook his furry head. "The station is a precious historic monument, our sole surviving relic of the early Earth and early man. You are part of it. I'm sorry if you take that for a misfortune, but there is certainly no place for you on Earth."

2.

Sandor Pen kept coming to the Moon as we grew up, though not so often. He brought tantalizing gifts. Exotic fruits that had to be eaten before they spoiled. New games and difficult puzzles. Little holo cubes that had held living pictures of us, caught us year after year as we grew up from babies in the maternity lab. He was always genial and kind, though I thought he came to care less for us as we grew older.

His main concern was clearly the station itself. He cleared junk and debris out of the deepest tunnels, which had been used for workshops and storage, and stocked them again with new tools and spare parts that the robots could use to repair themselves and maintain the station.

Most of his time on the visits was spent in the library and museum with Dian and her holo mother. He studied the old books and holos and paintings and sculptures, carried them away to be restored, and brought identical copies back to replace them. For a time he had the digging machines busy again, removing rubble from around the station and grinding it up to make concrete for a massive new retaining wall that they poured to reinforce the station foundation.

For our twenty-first birthday, he had the robots measure us for space suits like his own. Sleek and mirror-bright, they fitted like our skins and let us feel at home outside the dome. We wore them down to see one of our old rocket spaceplanes, standing on the field beside his little slipship. His robots had dug it out of a smashed hangar, and he now had them rebuilding it with new parts from Earth.

One of the great digging machines had extended a leverlike arm to hold it upright. A robot was replacing a broken landing strut, fusing it smoothly in place with some process that made no glow of heat. Casey spoke to the robot, but it ignored him. He climbed up to knock on the door. It responded with a brittle computer voice that was only a rattle in our helmets.

"Open up," he told it. "Let us in."

"Admission denied." Its hard machine voice had Pen's accent.

"By what authority?"

"By the authority of Director Sandor Pen, Lunar Research Site."

"Ask the director to let us in."

"Admission denied."

"So you think." Casey shook his head, his words a sardonic whisper in my helmet. "If you know how to think."

Back inside the air lock, Pen had waited to help us shuck off the mirror suits. Casey thanked him for the gift and asked if the old spaceplane would be left here on the Moon.

"Forget what you're thinking." He gave Casey a penetrating glance. "We're taking it down to Earth."

"I wish I could come."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"I'm sorry you can't." His face was firmly set, but a flush of pleasure turned it a richer gold. "It's to stand at the center of our new historic memorial, located on the Australian subcontinent. It presents our reconstruction of the prehistoric past. The whole story of the pre-impact planet and pre-impact man."

He paused to smile at Tanya. Flushed pink, she smiled back at him.

"It's really magnificent! Finding the lunar site was my great good fortune, and working it has been my life for many years. It has filled a gap in human history. Answered questions that scholars had fought over for ages. You yourselves have a place there, with a holographic diorama of your childhood."

Casey asked again why we couldn't see it.

"Because you belong here." Impatience edged his voice. "And because of the charter that allowed us to work the site. We agreed to restore the station to its original state, and to import no genetic materials from it that might contaminate the Earth. We are to leave the site exactly as it was before the impact, protected and secured from any future trespass."

We all felt sick with loss on the day he told us his work at the site was done. As a farewell gift, he took us two by two to orbit the Moon. Casey and I went up together, sitting behind him in his tiny slipship. We had seen space and Earth from the dome all our lives, but the flight was still an exciting adventure.

The mirror hull was invisible from inside, so that our seats seemed to float free in open space. The Moon's gray desolation spread wider beneath us, and dwindled again to a bright bubble floating in a gulf of darkness. Though Pen touched nothing I saw, the stars blazed suddenly brighter, the Milky Way a broad belt of gem-strewn splendor all around us. The sun was dimmed and hugely magnified to let us see the dark spots across its face.

Still he touched nothing and I felt no new motion, but now Australia expanded. The deserts were gone. A long new sea lay across the center of the continent, crescent-shaped and vividly blue.

"The memorial." He pointed to a broad tongue of green land thrust into the crescent. "If you ever get to Earth—which I don't expect—you could meet your doubles there in the Tycho exhibit."

Casey asked, "Is Mona there?"

Mona Lisa Live was the professional name of the woman Casey's father brought with him when he forced his way aboard the escape plane just ahead of the first impact. We knew them only from their holo images, he with the name "El Chino" and the crossed flags of Mexico and China tattooed across his black chest, she with the Leonardo painting on her belly.

Those ancient images had been enough to let us all catch the daring spirit and desperate devotion that had brought them finally to the Moon from the Medellin nightclub where he found her. From his first glimpse of her holo, Casey had loved her and dreamed of a day when they might be together again. I'd heard him ask my holo father why she had not been cloned with us.

"Ask the computer." He shrugged in the fatalistic way he had when his voice had its dry computer undertone. "It could have been done. Her tissue specimens are still preserved in the cryostat."

"Do you know why she wasn't cloned?"

"The computer seldom explains." He shrugged again. "If you want my own guess, she and Kell reached the Moon as unexpected intruders. The maternity lab was not prepared to care for them or their clones."

"Intruders?" Casey's dark face turned darker. "At least DeFort thought their genes were worth preserving. If I'm worth cloning, Mona ought to be. Someday she will be."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Back in the station dome, Pen made his final farewell. We thanked him for that exciting glimpse of the far-off Earth, for the space suits and all his gifts, for restoring us to life. A trifling repayment, he said, for all he had found at the station. He shook our hands, kissed Tanya and Dian, and got into his silvery suit. We followed him down to the air lock. Tanya must have loved him more than I knew. She broke into tears and ran off to her room as the rest of us watched his bright little teardrop float away toward Earth.

"We put them down there," Casey muttered. "We have a right to see what we have done."

When the robots left the restored spaceplane standing on its own landing gear, the digging machine crept away to join the others. Busy again, they were digging a row of deep pits. We watched them bury themselves under the rubble, leaving only a row of new craters that might become a puzzle, I thought, to later astronomers. Casey called us back to the dome to watch a tank truck crawling out of the underground hangar dug into the crater rim.

"We're off to Earth!" He slid his arm around Pepe. "Who's with us?"

Arne scowled at him. "Didn't you hear Sandor?"

"Sandor's gone." He grinned at Pepe. "We have a plan of our own."

They hadn't talked about it, but I had heard their whispers and seen them busy in the shops. Though the space-bending science of the slipship was still a mystery to us, I knew the robots had taught them astronautics and electronics. I knew they had made holos of Pen, begging him to say more about the new Earth than he ever would.

"I don't know your plan." Arne made a guttural grunt. "But I have seen the reports of people who went down to evaluate our terraforming. They've never found anything they liked, and never got back to the Moon."

"¿Qué importa?" Pepe shrugged. "Better that than wasting our lives waiting *por nada*."

"We belong here." Stubbornly, Arne echoed what Pen had said. "Our mission is just to keep the station alive. Certainly not to throw ourselves away on insane adventures. I'm staying here."

Dian chose to stay with him, though I don't think they were in love. Her love was the station itself, with all its relics of the old Earth. Even as a little child, she had always wanted to work with her holo mother, recording everything that Pen took away to be copied and returned.

Tanya had set her heart on Sandor Pen. I think she had always dreamed that someday he would take her with him back to Earth. She was desolate and bitter when he left without her, her pride in herself deeply hurt.

"He did love us when we were little," she sobbed when Pepe begged her to join him and Casey. "But just because we were children. Or just interesting pets. Interesting because we aren't his kind of human, and people that live forever don't have children."

Pepe begged again, I think because he loved her. Whatever they found on Earth, it would be bigger than our tunnels, and surely more exciting. She cried and kissed him and chose to stay. The new Earth had no place for her. Sandor wouldn't want her, even if she found him. She promised to listen for their radio and pray they came back safe.

I had always been the station historian. Earth was where history was happening. I shook hands with Pepe and Casey and agreed to go with them.

"You won't belong," Tanya warned us. "You'll have to look out for yourselves."

She found water canteens and ration packs for us, and reminded us to pack safari garments to wear when we got out of our space gear. We took turns in the dome, watching the tank truck till it

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

reached the plane and the robots began pumping fuel.

"Time." Casey wore a grin of eager expectation. "Time to say good-bye."

Dian and Arne shook our hands, wearing very solemn faces. Tanya clung a long time to Pepe and kissed me and Casey, her face so tear-stained and drawn that I ached with pity for her. We got into our shining suits, went out to the plane, climbed the landing stair. Again the door refused to open.

Casey stepped back to speak on his helmet radio.

"Priority message from Director Sandor Pen." His crackling voice was almost Pen's. "Special orders for restored spaceplane SP2469."

The door responded with a clatter of speech that was alien to me.

"Orders effective now," Casey snapped. "Tycho Station personnel K. C. Kell, Pedro Navarro, and Duncan Yare are authorized to board for immediate passage to Earth."

Silently, the door swung open.

I had expected to find a robot at the controls, but we found ourselves alone in the nose cone, the pilot seat empty. Awed by whatever the plane had become, we watched it operate itself. The door swung shut. Air seals hissed. The engines snorted and roared. The ship trembled, and we lifted off the Moon.

Looking back for the station, all I found was the dome, a bright little eye peering into space from the rugged gray peaks of the crater rim. It shrank till I lost it in the great lake of black shadow and the bright black peak at the center of the Tycho crater. The Moon dwindled till we saw it whole, gray and impact-battered, dropping behind us into a black and bottomless pit.

Pen's flight in the slipship may have taken an hour or an instant. In the old rocket ship, we had time to watch three full rotations of the slowly swelling planet ahead. The jets were silent through most of the flight, with only an occasional whisper to correct our course. We floated in free fall, careful not to blunder against the controls. Taking turns belted in the seats, we tried to sleep but seldom did. Most of the time we spent searching Earth with binoculars, searching for signs of civilization.

"Nothing," Casey muttered again and again. "Nothing that looks like a city, a railway, a canal, a dam. Nothing but green. Only forest, jungle, grassland. Have they let the planet return to nature?"

"Tal vez." Pepe always shrugged. *"Pero o no.* We are still too high to tell."

At last the jets came back to life, steering us down into air-breaking orbit. Twice around the puzzling planet, and Australia exploded ahead. The jets thundered. We fell again, toward the wide tongue of green land between the narrow cusps of that long crescent lake.

3.

Looking from the windows, we found the spaceplane standing on an elevated pad at the center of a long quadrangle covered with tended lawns, shrubs and banks of brilliant flowers. Wide avenues all around it were walled with buildings that awed and amazed me.

"Sandor's Tycho Memorial!" Pepe jogged my ribs. "There's the old monument at the American capital! I know it from Dian's videos."

"Ancient history." Casey shrugged as if it hardly mattered. "I want to see Earth today."

Pepe opened the door. In our safari suits, we went out on the landing for a better view. The door shut. I heard it hiss behind us, sealing itself. He turned to stare again. The monument stood at the end of the quadrangle, towering above its image in a long reflecting pool, flanked on one side by a Stonehenge in gleaming silver, on the other by a sand-banked Sphinx with the nose restored.

We stood goggling at the old American capital at the other end of the mall, the British Houses of Parliament to its right, and the Big Ben tolling the time.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

The Kremlin adjoined them, gilded onion domes gleaming above the grim red-brick walls. The Parthenon, roofed and new and magnificent as ever, stood beyond them on a rocky hill.

Across the quadrangle I found the splendid domes of the Taj Mahal, Saint Peter's Basilica, the Hagia Sophia from ancient Istanbul. On higher ground in the distance, I recognized the Chrysler Building from old New York, the Eiffel Tower from Paris, a Chinese pagoda, the Great Pyramid clad once again in smooth white marble. Farther off, I found a gray mountain ridge that copied the familiar curve of Tycho's rim, topped with the shine of our own native dome.

"We got here!" Elated, Pepe slapped Casey's back. "Now what?"

"They owe us." Casey turned to look again. "We put them here, whenever it was. This ought to remind them how they got here and what we've given them."

"If they care." Pepe turned back to the door. "Let's see if we can call Sandor."

"Facility closed." We heard the door's toneless robot voice. "Admission denied by order of Tycho Authority."

"Let us in!" Casey shouted. "We want the stuff we left aboard. Clothing, backpacks, canteens. Open the door so we can get them."

"Admission denied."

He hit the door with his fist and kissed his bruised knuckles.

"Admission denied."

"We're here, anyhow."

Pepe shrugged and started down the landing stair. A strange bellow stopped him, rolling back from the walls around. It took us a moment to see that it came from a locomotive chuffing slowly past the Washington Monument, puffing white steam. Hauling a train of open cars filled with seated passengers, it crept around the quadrangle, stopping often to let riders off and on.

The Sun was high, and we shaded our eyes to study them. All as lean and trim as Sandor, and often nude, they had the same nut-brown skins. Many carried bags or backpacks. A few scattered across the lawns and gardens, most waited at the corners for signal lights to let them cross the avenue.

"Tourists, maybe?" I guessed. "Here to see Sandor's recovered history?"

"But I see no children." Casey shook his head. "You'd think they'd bring the children."

"They're people, anyhow." Pepe grinned hopefully. "We'll find somebody to tell us more than Sandor did."

We climbed down the stairs, on down a wide flight of steps to a walk that curved through banks of strange and fragrant blooms. Ahead of us a couple had stopped. The woman looked a little odd, I thought, with her head of short ginger-hued fur instead of hair, yet as lovely as Mona had looked in the holos made when she and El Chino reached the Moon. The man was youthful and handsome as Sandor. I thought they were in love.

Laughing at something he had said, she ran a little way ahead and turned to pose for his camera, framed between the monument and the Sphinx. She had worn a scarlet shawl around her shoulders. At a word from him, she whipped it off and smiled for his lens. Her daintily nippled breasts had been pale beneath the shawl, and he waited for the sun to color them.

We watched till he had snapped the camera. Laughing again, she ran back to toss the shawl around his shoulders and throw her arms around him. They clung together for a long kiss. We had stopped a dozen yards away. Casey spoke hopefully when they turned to face us.

"Hello?"

They stared blankly at us. Case managed an uncertain smile, but a nervous sweat had filmed his dark Oriental face.

"Forgive us, please. Do you speak

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

English? *Français? ¿Español?"*

They frowned at him, and the man answered with a stream of vowels that were almost music and a rattle of consonants I knew I could never learn to imitate. I caught a hint of Sandor's odd accent but nothing like our English. They moved closer. The man pulled the little camera out of his bag, clicked it at Casey, stepped nearer to get his head. Laughing at him, the woman came to pose again beside Casey, slipping a golden arm around him for a final shot.

"We came in that machine. Down from the Moon!" Desperation on his face, he gestured at the spaceplane behind us, turned to point toward the Moon's pale disk in the sky above the Parthenon, waved to show our flight from it to the pedestal. "We've just landed from Tycho Station. If you understand—"

Laughing at him, they caught hands and ran on toward the Sphinx.

"What the hell!" Staring after them, he shook his head. "What the bloody hell!"

"They don't know we're real." Pepe chuckled bitterly. "They take us for dummies. Part of the show."

We followed a path that led toward the Parthenon and stopped at the curb to watch the traffic flowing around the quadrangle. Cars, buses, vans, occasional trucks; they reminded me of street scenes in pre-impact videos. A Yellow Cab pulled up beside us. A woman sprang out. Slim and golden-skinned, she was almost a twin of the tourist who had posed with Casey.

The driver, however, might have been an unlikely survivor from the old Earth. Heavy, swarthy, wheezing for his breath, he wore dark glasses and a grimy leather jacket. Lighting a cigarette, he hauled himself out of the cab, waddled around to open the trunk, handed the woman a folded tripod, and grunted sullenly when she tipped him.

Casey walked up to him as he was climbing back into the cab.

"Sir!" He seemed not to hear, and Casey called louder. "Sir!"

Ignoring us, he got into the cab and pulled away. Casey turned with a baffled frown to Pepe and me.

"Did you see his face? It was dead! Some stiff plastic. His eyes are blind, behind those glasses. He's some kind of robot, no more alive than our robots on the Moon."

Keeping a cautious distance, we followed the woman with the tripod. Ignoring us, she stopped to set it up to support a flat round plate of some black stuff. As she stepped away, a big transparent bubble swelled out of the plate, clouded, turned to silver. She leaned to peer into it.

Venturing closer, I saw that the bubble had become a circular window that framed the Washington Monument, the Statue of Liberty, and the Sphinx. They seemed oddly changed, magnified and brighter, suddenly in motion. Everything shook. The monument leaned and toppled, crushing the statue. The Sphinx looked down across the fragments, intact and forever enigmatic.

I must have come too close. The woman turned with an irritated frown to brush me away as if I had been an annoying fly. Retreating, I looked again. As she bent again to the window, the sky in it changed. The Sun exploded into a huge, dull-red ball that turned the whole scene pink. Close beside it was a tiny, bright-blue star. Our spaceplane took shape in the foreground, the motors firing and white flame washing the pedestal, as if it were taking off to escape catastrophe.

Awed into silence, Casey gestured us away.

"An artist!" Pepe whispered. "An artist at work."

We walked on past the Parthenon and waited at the corner to cross the avenue. Pepe nodded at the blue-clad cop standing out on the pavement with a whistle and a white

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

baton, directing traffic.

"Watch him. He's mechanical."

So were most of the drivers. The passengers, however, riding in the taxis and buses or arriving on the train, looked entirely human, as live as Sandor himself, eager as the tourists of the pre-impact Earth to see these monumental restorations of their forgotten past.

They flocked the sidewalks, climbed the Capital steps to photograph the quadrangle and one another, wandered around the corner and on down the avenue. We fell in with them. They seldom noticed Pepe or me, but sometimes stopped to stare at Casey or take his picture.

"One more robot!" he muttered. "That's what they take me for."

We spent the rest of the day wandering replicated streets, passing banks, broker's offices, shops, bars, hairdressers, restaurants, police stations. A robot driver had parked his van in front of a bookstore to unload cartons stamped *Encyclopaedia Britannica*. A robot beggar was rattling coins in a tin cup. A robot cop was pounding in pursuit of a red-spattered robot fugitive. We saw slim gold-skinned people, gracefully alive, entering restaurants and bars, trooping into shops, emerging with their purchases.

Footsore and hungry before the day was over, we followed a tantalizing aroma that led us to a line of golden folk waiting under a sign that read:

STEAK PLUS!
PRIME ANGUS BEEF
DONE TO YOUR ORDER

Pepe fretted that we had no money for a meal.

"We'll eat before we tell them," Casey said.

"They're human, anyhow." Pepe grasped for some crumb of comfort. "They like food."

"I hope they're human."

Standing in line, I watched and listened to those ahead of us, hoping for any link of human contact, finding none at all. A few turned to give us puzzled glances. One man stared at Casey till I saw his fists clenching. Their speech sometimes had rhythm and pitch that made an eerie music, but I never caught a hint of anything familiar.

A robot at the door was admitting people a few at a time. His bright-lensed eyes looked behind us when we reached him. Finding nobody, he shut the door.

Limping under Earth gravity, growing hungrier and thirstier, we drifted on until the avenue ended at a high wall of something clear as glass, which cut the memorial off like a slicing blade. Beyond the wall lay an open landscape that recalled Dian's travel videos of tropical Africa. A line of trees marked a watercourse that wound down a shallow valley. Zebras and antelope grazed near us, unalarmed by a dark-maned lion watching sleepily from a little hill.

"There's water we could drink." Pepe nodded at the stream. "If we can get past the wall."

We walked on till it stopped us. Seamless, hard and slick, too tall for us to climb, it ran on in both directions as far as we could see. Too tired to go farther, we sat there on the curb watching the freedom of the creatures beyond till dusk and a chill in the air drove us back to look for shelter. What we found was a stack of empty cartons behind a discount furniture outlet. We flattened a few of them to make a bed, ripped up the largest to cover us, and tried to sleep.

"You can't blame Sandor," Pepe muttered as we lay there shivering under our cardboard. "He told us we'd never belong."

4.

We dozed on our cardboard pallet, aching under the heavy drag of Earth's gravity through a never-ending night, and woke stiff and cold and desperate. I

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

almost wished we were back on the Moon.

"There has to be a hole in the fence," Casey tried to cheer us. "To let the tourists in."

The train had come from the north. Back at the wall, we limped north along a narrow road inside it, our spirits lifting a little as exercise warmed us. Beyond a bend, the railway ran out of a tunnel, across a long steel bridge over a cliff-rimmed gorge the stream had cut, and into our prison through a narrow archway in the barrier.

"We'd have to walk the bridge." Pepe stopped uneasily to shake his head at the ribbon of water on the canyon's rocky floor, far below. "A train could catch us on the track."

"We'll just wait for it to pass," Casey said.

We waited, lying hidden in a drainage ditch beside the track till the engine burst out of the tunnel, steam whistle howling. The cars rattled past us, riders leaning to stare at Sandor's restorations ahead. We clambered out of the ditch and sprinted across the bridge. Jumping off the track at the tunnel mouth, we rolled down a grass slope, got our breath, and tramped southwest away from the wall and into country that looked open.

The memorial sank behind a wooded ridge until all we could see was Sandor's replica of our own lookout dome on his replica of Tycho's rugged rim. We came out across a wide valley floor, scattered with clumps of trees and grazing animals I recognized; wildebeest, gazelles, and a little herd of graceful impala.

"Thanks to old Calvin DeFort. Another Noah saving Earth from a different deluge." Casey shaded his eyes to watch a pair of ostriches running from us across the empty land. "But where are the people?"

"Where's any water?" Pepe muttered. "No deluge, please. Just water we can drink."

We plodded on through tall green grass till I saw elephants marching out of a stand of trees off to our right. A magnificent bull with great white tusks, half a dozen others behind him, a baby with its mother. They came straight toward us. I wanted to run, but Casey simply beckoned for us to move aside. They ambled past us to drink from a pool we hadn't seen. Waiting till they had moved on, we turned toward the pool. Pepe pushed ahead and bent to scoop water up in his cupped hands.

"Don't!" a child's voice called behind us. "Unclean water might harm you."

A small girl came running toward us from the trees where the elephants had been. The first child we had seen, she was daintily lovely in a white blouse and a short blue skirt, her fair face half hidden under a wide-brimmed hat tied under her chin with a bright red ribbon.

"Hello." She stopped a few yards away, her blue eyes wide with wonder. "You are the Moon men?"

"And strangers here." Casey gave her our names. "Strangers in trouble."

"You deceived the ancient space ship," she accused us soberly. "You should not be here on Earth."

We gaped at her. "How did you know?"

"The ship informed my father."

We stood silent, lost in wonder of our own. A charming picture of childish innocence, but she had shaken me with a chill of terror. Pepe stepped warily back from her, but after a moment Casey caught his breath to ask, "Who is your father?"

"You called him your uncle when you knew him on the Moon." Pride lit her face. "He is a very great and famous man. He discovered the lunar site and recovered the lost history of humankind. He rebuilt the ancient structures you saw around you where the ship came down."

"I get it." Casey nodded, looking crestfallen and dazed. "I think I begin to get it."

"We can't be sorry." Blinking at her,

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Pepe caught a long breath. "We'd had too much of the Moon. But now we're lost here, in a world I don't begin to understand. Do you know what will happen to us?"

"My father isn't sure." She looked away toward the replicated Tycho dome. "I used to beg him to take me with him to the Moon. He said the station had no place for me." She turned to study us again. "You are interesting to see. My name is—"

She uttered a string of rhythmic consonants and singing vowels, and smiled at Pepe's failure when he tried to imitate them.

"Just call me Tling," she said. "That will be easier for you to say." She turned to Pepe. "If you want water, come with me."

We followed her back to a little circle of square stones in the shade of the nearest tree. Beckoning us to sit, she opened a basket, found a bottle of water, and filled a cup for Pepe. Amused at the eager way he drained it, she filled it again for him, and then for Casey and me.

"I came out to visit the elephants," she told us. "I love elephants. I am very grateful to you Moon people for preserving the tissue specimens that have kept so many ancient creatures alive."

I had caught a tantalizing fragrance when she opened the basket. She saw Pepe's eyes still on it.

"I brought food for some of my forest friends," she said. "If you are hungry."

Pepe said we were starving. She spread a white napkin on one of the stones and began laying out what she had brought. Fruits I thought were peachlike and grapelike and pearlike, but wonderfully sweet and different. Small brown cakes with aromas that that wet my mouth. We devoured them so avidly that she seemed amused.

"Where are the people?" Casey waved his arm at the empty landscape. "Don't you have cities?"

"We do," she said. "Though my father says they are smaller than those you built on the prehistoric Earth." She gestured toward the elephants. "We share the planet with other beings. He says you damaged it when you let your own biology run out of control."

"Maybe we did, but that's not what brought the impactor." Casey frowned again. "You are the only child we have seen."

"There's not much room for us. You see, we don't die."

I was listening, desperately hoping for something that might help us find or make a place for ourselves, but everything I heard was making our new world stranger. Casey gazed at her.

"Why don't you die?"

"If I can explain—" She paused as if looking for an answer we might understand. "My father says I should tell you that we have changed ourselves since the clones came back to colonize the dead Earth. We have altered the genes and invented the nanorobs."

"Nanorobs?"

She paused again, staring at the far-off elephants.

"My father calls them artificial symbiotes. They are tiny things that live like bacteria in our bodies but do good instead of harm. They are partly organic, partly diamond, partly gold. They move in the blood to repair or replace injured cells, or regrow a missing organ. They assist our nerves and our brain cells."

The food forgotten, we were staring at her. A picture of innocent simplicity in the simple skirt and blouse and floppy hat, she was suddenly so frightening that I trembled. She reached to put her small hand on mine before she went on.

"My father says I should say they are tiny robots, half-machine and half-alive. They are electronic. They can be programmed to store digital information. They pulse in unison, making their own waves in the brain and turning the whole body into a radio antenna. Sitting here speaking to you, I can also speak to my father."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

She looked up to smile at me, her small hand closing on my fingers.

"Mr. Dunk, please don't be afraid of me. I know we seem different. I know I seem strange to you, but I would never harm you."

She was so charming that I wanted to take her in my arms, but my awe had grown to dread. We all shrank from her and sat wordless till hunger drove us to attack the fruit and cakes again. Pepe began asking questions as we ate.

Where did she live?

"On that hill." She nodded toward the west, but I couldn't tell which hill she meant. "My father selected a place where he could look out across the memorial."

Did she go to school?

"School?" The word seemed to puzzle her for a moment, and then she shook her head. "We do not require the schools my father says you had in the prehistoric world. He says your schools existed to program the brains of young people. Our nanocoms can be programmed and reprogrammed instantly, with no trouble at all, to load whatever information we need. That is how I learned your English when I needed it."

She smiled at his dazed face and selceted a plump purple berry for herself.

"Our bodies, however, do need training." Delicately, she wiped her lips on a white napkin. "We form social groups to play games or practice skills. We fly our sliders all around the Earth. I love to ski on high mountains where snow falls. I've dived off coral reefs to observe sea things. I like music, art, drama, games of creation."

"That should be fun." Pepe's eyes were wide. "More fun than life in our tunnels on the Moon." His face went suddenly dark. "I hope your father doesn't send us back there."

"He can't, even if he wanted to." She laughed at his alarm. "He's finally done with the excavation. The charter site is closed and protected for future ages. All intrusion prohibited."

"So what will he do with us?"

"Does he have to do anything?" Seeming faintly vexed, she looked off toward the station dome on the crater ridge. "He says he has no place ready for you, but there are humanoid replicates playing your roles there in the Tycho simulation. I suppose you could replace them, if that would make you happy."

"Pretending we were back on the Moon?" Casey turned grim. "I don't think so."

"If you don't want that—"

She stopped, tipped her head as if to listen, and began gathering the water bottle and the rest of the fruit into the basket. Anxiously, Pepe asked if something was wrong.

"My mother." Frowning, she shook her head. "She's calling me home."

"Please!" Casey begged her. "Can't you stay a little longer? You are the only friend we've found. I don't know what we can do without you."

"I wish I could help you, but my mother is afraid for me."

"I wondered if you weren't in danger." He glanced out across the valley. "We saw a lion. Your really shouldn't be out here alone."

"It's not the lion." She shook her head. "I know him. A wonderful friend, so fast and strong and fierce." Her eyes shone at the recollection. "And I know a Bengal tiger. He was hiding in the brush because he was afraid of people. I taught him that we would never hurt him. Once he let me ride him when he chased a gazelle. It was wonderfully exciting."

Her voice grew solemn.

"I'm glad the gazelle got away, though the tiger was hungry and very disappointed. I try to forgive him, because I know he has to kill for food, like all the lions and leopards. They must kill, to stay alive. My mother says it is the way of nature, and entirely necessary. Too many grazing things would destroy the grass and finally starve themselves."

We stared again, wondering at her.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"How did you tame the tiger?"

"I think the nanorobs help me reach his mind, the way I touch yours. He learned that I respect him. We are good friends. He would fight to protect me, even from you."

"Is your mother afraid of us?"

She picked up the basket and stood shifting on her feet, frowning at us uncertainly.

"The nanorobs—" She hesitated. "I trust you, but the nanorobs—"

She stopped again.

"I thought you said nanorobs were good."

"That's the problem." She hesitated, trouble on her face. "My mother says you have none. She can't reach your minds. You do not hear when she speaks to you. She says you don't belong, because you are not one of us. What she fears—what she fears is you."

Speechless, Casey blinked at her sadly.

"I am sorry to go so soon." With a solemn little bow for each of us, she shook our hands. "Sorry you have no nanorobs. Sorry my mother is so anxious. Sorry to say good-bye."

"Please tell your father—" Casey began.

"He knows," she said. "He is sorry you came here."

Walking away with her basket, she turned to wave her hand at us, her face framed for a moment by the wide-brimmed hat. I thought she was going to speak, but in a moment she was gone.

"Beautiful!" Casey whispered. "She'll grow up to be another Mona."

Looking back toward the copied monuments of the old Earth, the copied station dome shining on the copied Tycho rim, I saw a dark-maned lion striding across the valley toward the pool where the elephants had drunk. Three smaller females followed. None of them our friends. I shivered.

* * *

5.

We wandered on up the valley after Tling left us, keeping clear of the trees and trying to stay alert for danger or any hint of help.

"If Sandor lives out here," Casey said, "there must be others. People, I hope, who won't take us for robots."

We stopped to watch impala drinking at a water hole. They simply raised their heads to look at us, but fled when a cheetah burst out of a thicket. The smallest was too slow. The cheetah knocked it down and carried it back into the brush.

"No nanorobs for them," Pepe muttered. "Or us."

We tramped on, finding no sign of anything human. By midafternoon, hungry and thirsty again, with nothing human in view ahead, we sat down to rest on an outcropping of rock. Pepe dug a little holo of Tanya out of his breast pocket and passed it to show us her dark-eyed smile.

"If we hadn't lost the radio—" He caught himself, with a stiff little grin. "Still, I guess we wouldn't call. I'd love to hear her voice. I know she's anxious, but I wouldn't want her to know the fix we're in—"

He stopped when a shadow flickered across the holo. Looking up, we found a silvery slider craft dropping to the grass a few yards from us. An oval door dilated in the side of it. Tling jumped out.

"We found you!" she cried. "Even with no nanorobs. Here is my mother."

A slender woman came out behind her, laughing at Pepe when he tried to repeat the name she gave us.

"She says you can just call her Lo."

Tling still wore the blouse and skirt, with her wide-brimmed hat, but Lo was nude except for a gauzy blue sash worn over her shoulder. As graceful and trim, and nearly as sexless as Sandor, she had the same cream-colored skin, already darkening where the sun struck it, but she had a thick crown of bright red-brown curls instead of Sandor's cap of

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

sleek fur.

"Dr. Yare." Tling spoke carefully to let us hear. "Mr. Navarro. Mr. Kell, who is also called El Chino. They were cloned at Tycho Station from prehistoric tissue specimens."

"You were cloned for duty there." Lo eyed us severely. "How did you get here?"

"We lied to the ship." Casey straightened wryly to face her. "We did it because we didn't want to live out our lives in that pit on the Moon. I won't say I'm sorry, but now we are in trouble. I don't want to die."

"You will die," she told him bluntly. "Like all your kind. You carry no nanorobs."

"I guess." He shrugged. "But first we want a chance to live."

"Mother, please!" Tling caught her hand. "With no nanorobs, they are in immediate danger here. Can we help them stay alive?"

"That depends on your father."

"I tried to ask him," Tling said. "He didn't answer."

We watched Lo's solemn frown, saw Tling's deepening trouble.

"I wish you had nanorobs." She turned at last to translate for us. "My father has gone out to meet an interstellar ship that has just come back after eight hundred years away. The officers are telling him a very strange story."

She looked up at her mother, as if listening.

"It carried colonists for the planets of the star Enthel, which is four hundred light-years toward the galactic core. They had taken off with no warning of trouble. The destination planet had been surveyed and opened for settlement. It had rich natural resources, with no native life to be protected. Navigation algorithms for the flight had been tested, occupation priorities secured."

She stared up at the sky, in baffled dismay.

"Now the ship has returned, two thousand colonists still aboard."

Casey asked what had gone wrong. We waited, watching their anxious frowns.

"My father is inquiring." Tling turned back to us. "He's afraid of something dreadful."

"It must have been dreadful," Pepe whispered. "Imagine eight hundred years on a ship in space!"

"Only instants for them." Tling shook her head, smiling at him. "Time stops, remember, at the speed of light. By their own time, they left only yesterday. Yet their situation is still hard enough. Their friends are scattered away. Their whole world is gone. They feel lost and desperate."

She turned to her mother. "Why couldn't they land?"

Her mother listened again. Far out across the valley I saw a little herd of zebras running. I couldn't see what had frightened them.

"My father is asking," she told us at last. "The passengers were not told why the ship had to turn back. The officers have promised a statement, but my father says they can't agree on what to say. They aren't sure what they found on the destination planet. He believes they're afraid to say what they believe."

The running zebras veered aside. I saw the tawny flash of a lion charging to meet them, saw a limping zebra go down. My own ankle was aching from a stone that had turned under my foot, and I felt as helpless as the zebra.

"Don't worry, Mr. Dunk." Tling reached to touch my arm. "My father is very busy with the ship. I don't know what he can do with you, but I don't want the animals to kill you. I think we can keep you safe till he comes home. Can't we, mother?"

Her lips pressed tight, Lo shrugged as if she had forgotten us.

"Please, mother. I know they are primitives, but they would never harm me. I can understand them the way I understand the animals. They are hun-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

gry and afraid, with nowhere else to go."

Lo stood motionless for a moment, frowning at us.

"Get in."

She beckoned us into the flyer and lifted her face again as if listening to the sky.

We soared toward a rocky hill and landed on a level ledge near the summit. Climbing out, we looked down across the grassy valley and over the ridge to Sandor's memorial just beyond. Closer than I expected, I found the bright metal glint of the rebuilt spaceplane on the mall, the Capitol dome and the Washington obelisk, the white marble sheen of the Egyptian pyramid looming out of green forest beyond.

"My father picked this spot." Tling nodded toward the cliff. "He wanted to watch the memorial built."

While her mother stood listening intently at the sky, Tling inspected our mudstained safari suits.

"You need a bath," she decided, "before you eat."

Running ahead, she took us down an arched tunnel into the hill and showed me into a room far larger than my cell below the station dome. Warm water sprayed me when I stepped into the shower, warm air dried me. A human-shaped robot handed me my clothing when I came out, clean and neatly folded. It guided me to a room where Tling was already sitting with Pepe and Casey at a table set with plates around a pyramid of fragrant fruit.

"Mr. Chino asked about my mother." She looked up to smile at me. "You saw that she's different, with different nanorobs. She comes from the Garenkrake system, three hundred light-years away. Its people had forgotten where they came from. She wanted to know. When her search for the mother planet brought her here, she found my father already digging at the Tycho site. They've worked together ever since."

Pepe and Casey were already eating. Casey turned to Tling, who was nibbling delicately at something that looked like a huge purple orchid.

"What do you think will happen to us?"

"I'll ask my father when I can." She glanced toward the ceiling. "He is still busy with the ship's officers. I'm sorry you're afraid of my mother. She doesn't hate you, not really. If she seems cool to you, it's just because she has worked so long at the site, digging up relics of the first world. She thinks you seem so—so primitive."

She shook her head at our uneasy frowns.

"You told her you lied to the ship." She looked at Casey. "That bothers her, because the nanorobs do not transmit untruths or let people hurt each other. She feels sorry for you."

Pepe winced. "We feel sorry for ourselves."

Tling sat for a minute, silently, frowning, and turned back to us.

"The ship is big trouble for my father," she told us. "It leaves him no time for you. He says you should have stayed on the Moon."

"I know." Casey shrugged. "But we're here. We can't go back. We want to stay alive."

"I feel your fear." She gave us an uneasy smile. "My father's too busy to talk to you, but if you'll come to my room, there is news about the ship."

The room must have been her nursery. In one corner was a child's bed piled with dolls and toys, a cradle on the floor beside it. The wall above was alive with a scenic holo. Long-legged birds flew away from a water hole when a tiger came out of tall grass to drink. A zebra stallion ventured warily close, snuffing at us. A prowling leopard froze and ran from a bull elephant. She gestured at the wall.

"I was a baby here, learning to love the animals."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

That green landscape was suddenly gone. The wall had become a wide window that showed us great spacecraft drifting though empty blackness. Blinding highlights glared where the Sun struck it. The rest was lost in shadow, but I made out a thick bright metal disk, slowly turning. Tiny-looking sliders clung around a bulging dome at its center.

"It's in parking orbit, waiting for anywhere to go." Tling said. "Let's look inside."

She gave us glimpses of the curving floors where the spin created a false gravity. People sat in rows of seats like those in holos of ancient aircraft. More stood crowded in aisles and corridors. I heard scrap of hushed and anxious talk.

". . . home on a Pacific island."

The camera caught a woman with a crown of what looked like bright golden feathers instead of hair. Holding a whimpering baby in one arm, the other around a grim-faced man, she was answering questions from someone we didn't see. The voice we heard was Tling's.

"It's hard for us." Her lips were not moving, but the voice went sharp with her distress. "We had a good life there. Mark's an imagineer. I was earning a good living as a genetic artist, designing ornamentals to special order. We are not the pioneer type, but we did want a baby." An ironic wry smile twisted her lips. "A dream come true!"

She lifted the infant to kiss its gold-capped head.

"Look at us now." She smiled sadly at the child. "We spent our savings for a vision of paradise on Fendris Four. A tropical beachfront between the surf and a bamboo forest, snow on a volcanic cone behind it. A hundred families of us, all friends forever."

She sighed and rocked the baby.

"They didn't let us off the ship. Or even tell us why. We're desperate, with our money gone and baby to care for. Now they say there's nowhere else we can go."

The wall flickered and the holos came back with monkeys chattering in jungle treetops.

"That's the problem," Tling said. "Two thousand people like them, stuck on the ship with nowhere to live. My father's problem now, since the council voted to put him in charge."

Casey asked, "Why can't they leave the ship?"

"If you don't understand—" She was silent for a moment. "My mother says it's the way of the nanorobs. They won't let people overrun the planet and use it up like my mother says the primitives did, back before the impacts. Births must be balanced by migration. Those unlucky people lost their space when they left Earth."

"Eight hundred years ago?"

"Eight hundred of our time." She shrugged. "A day or so of theirs."

"What can your father do for them?"

"My mother says he's still searching for a safe destination."

"If he can't find one—" Casey frowned. "And they can't come home. It seems terribly unfair. Do you let the nanorobs rule you?"

"Rule us?" Puzzled, she turned her head to listen and nodded at the wall. "You don't understand. They do unite us, but there is no conflict. They live in all of us, acting to keep us alive and well, guiding us to stay free and happy, but moving us only by our own consent. My mother says they are part of what you used to call the unconscious."

"Those people on the ship?" Doubtfully, Casey frowned. "Still alive, I guess, but not free to get off or happy at all."

"They are troubled." Nodding soberly, she listened again. "But my mother says I should explain the nanorob way. She says the old primitives lived in what she calls the way of the jungle genes, back when survival required traits of selfish aggression. The nanorobs have let us change our genes to escape the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

greed and jealousy and violence that led to so much crime and war and pain on the ancient Earth. They guide us toward what is best for all. My mother says the people on the ship will be content to follow the nanorob way when my father has helped them find it."

She turned her head. "I heard my mother call."

I hadn't heard a thing, but she ran out of the room. In the holo wall, high-shouldered wildebeest were leaping off a cliff to swim across a river. One stumbled, toppled, vanished under the rapid water. We watched in dismal silence till Casey turned to frown at Pepe and me.

"I don't think I like the nanorob way."

We had begun to understand why Sandor had no place on Earth for us.

6.

"Dear sirs, I must beg you to excuse us."

Tling made a careful little bow and explained that her mother was taking her to dance and music practice, then going on to a meeting about the people on the stranded ship. We were left alone with the robots. They were man-shaped, ivory-colored, blank-faced. Lacking nanorobs, they were voice-controlled.

Casey tried to question them about the population, cities, and industries of the new Earth, but they had been programmed only for domestic service, with no English or information about anything else. Defeated by their blank-lensed stares, we sat out on the terrace, looking down across the memorial and contemplating our own uncertain future, till they called us in for dinner.

The dishes they served us were strange, but Pepe urged us to eat while we could.

"¿Mañana?" He shook his head uneasily. *"¿Quién sabe?"*

Night was falling before we got back to the terrace. A thin Moon was setting in the west. In the east, a locomotive headlight flashed across the memorial. The mall was lit for evening tours, the Taj Mahal a glowing gem, the Great Pyramid an ivory island in the creeping dusk. The robots had our beds ready when the light went out. They had served wine with dinner, and I slept without a dream.

Awake early next morning, rested again and lifted with unreasonable hope, I found Tling standing outside at the end of the terrace, looking down across the valley. She had hair like her mother's, not feathers or fur, but blonde and cropped short. Despite the awesome power of her nanorobs, I thought she looked very small and vulnerable. She started when I spoke.

"Good morning, Mr. Dunk." She wiped at her face with the back of her hand and tried to smile. I saw that her eyes were puffy and red. "How is your ankle?"

"Better."

"I was worried." She found a pale smile. "Because you have no symbiotes to help repair such injuries."

I asked if she had heard from her father and the emigrant ship. She turned silently to look again across the sunlit valley and the memorial. I saw the far plume of steam from an early train crawling over the bridge toward the Sphinx.

"I watched a baby giraffe." Her voice was slow and faint, almost as if she was speaking to herself. "I saw it born. I watched it learning to stand, nuzzling its mother, learning to suck. It finally followed her away, wobbling on its legs. It was beautiful—"

Her voice failed. Her hand darted to her lips. She stood trembling, staring at me, her eyes wide and dark with pain.

"My father!" Her voice came suddenly sharp and thin, almost a scream. "He's going away. I'll never see him again."

She ran back inside.

When the robots called us to breakfast, we found her sitting between her parents. She had washed her tear-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

streaked face, but the food on her plate had not been touched. Here out of the Sun, Sandor's face had gone pale and grim. He seemed not to see us till Tling turned to frown at him. He rose then, and came around the table to shake our hands.

"Good morning, Dr. Pen." Casey gave him a wry smile. "I see why you didn't want us here, but I can't apologize. We'll never be sorry we came."

"Sit down." He spoke shortly. "Let's eat."

We sat. The robots brought us plates loaded with foods we had never tasted. Saying no more to us, Sandor signaled a robot to refill his cup of the bitter black tea and bent over a bowl of crimson berries. Tling sat looking up at him in anguished devotion till Casey spoke.

"Sir, we heard about your problem with the stranded colonists. Can you tell us why their ship came back?"

"Nothing anybody understands." He shook his head and gave Tling a tender smile before he pushed the berries aside and turned gravely back to us. His voice was quick and crisp. "The initial survey expedition had found their destination planet quite habitable and seeded it with terran-type life. Expeditions had followed to settle the three major continents. This group was to find room on the third.

"They arrived safe but got no answer when they called the planet from orbit. The atmosphere was hazed with dust that obscured the surface, but a search in the infrared found relics of a very successful occupation. Pavements, bridges, masonry, steel skeletons that had been buildings. All half buried under dunes of red, wind-blown dust. No green life anywhere. A derelict craft from one of the pioneer expeditions was still in orbit, but dead as the planet.

"They never learned what killed the planet. No news of the disaster seems to have reached any other world, which suggests that it struck unexpectedly and spread fast. The medical officers believe the killer may have been some unknown organism that attacks organic life, but the captain refused to allow any attempt to land or investigate. She elected to turn back at once, without contact. A choice that probably saved their lives."

He picked up his spoon and bent again to his bowl of berries. I tried one of them. It was tart, sweet, with a heady tang I can't describe.

"Sir," Casey spoke again, "we saw those people. They're desperate. What will happen to them now?"

"A dilemma." Sandor looked at Tling, with a sad little shrug. She turned her head to hide a sob. "Habitable planets are relatively rare. The few we find must be surveyed, terraformed, approved for settlement. As events came out, these people have been fortunate. We were able to get an emergency waiver that will allow them to settle on an open planet, five hundred light-years in toward the core. Fuel and fresh supplies are being loaded now."

"And my father—" Tling looked up at me, her voice almost a wail. "He has to go with them. All because of me."

He put his arm around her and bent his face to hers. Whatever he said was silent. She climbed into his arms. He hugged her, rocking her back and forth like a baby, till her weeping ceased. With a smile that broke my heart, she kissed him and slid out of his arms.

"Excuse us, please." Her voice quivering, she caught his hand. "We must say good-bye."

She led him out of the room.

Lo stared silently after them till Pepe tapped his bowl to signal the robots for a second serving of the crimson berries.

"It's true." With a long sigh, she turned back to us. "A painful thing for Tling. For all three of us. This is not what we planned."

Absently, she took a little brown cake from a tray the robot was passing and laid it on her plate, untasted.

"¿Que tienes?" Pepe gave her a puz-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

zled look.

"We hoped to stay together," she said. "Sandor and I have worked here for most of the century, excavating the site and restoring what we could. With that finished, I wanted to see my homeworld again. We were going back there together, Tling with us. Taking the history we had learned, we were planning to replicate the memorial there."

Bleakly, she shook her head.

"This changes everything. Sandor feels a duty to help the colonists find a home. Tling begged him to take us with him, but—" She shrugged in resignation, her lips drawn tight. "He's afraid of whatever killed Enthel Two. And there's something else. His brother—"

She looked away for a moment.

"He has a twin brother. His father had to emigrate when they were born. He took the twin. His mother had a career in nanorob genetics she couldn't leave. Sandor stayed here with her, longing for his twin. He left when he was grown, searched a dozen worlds, never found him. He did find me. That's the happy side."

Her brief smile faded.

"A hopeless quest, I've told him. There are too many worlds, too many light-years. Slider flights may seem quick, but they take too long. Yet he can't give up the dream."

"Can we—" Casey checked himself to look at Pepe and me. We nodded, and he turned anxiously back to Lo. "If Sandor does go out on the emigrant ship, would he take us with him?"

She shook her head and sat staring at nothing till Pepe asked, *"¿Por qué no?"*

"Reasons enough." Frowning, she picked up the little brown cake, broke it in half, dropped the fragments back on her plate. "First of all, the danger. Whatever killed that planet could kill another. He got the waiver, in fact, because others were afraid to go. The colonists had no choice, but he doesn't want to kill you."

"It's our choice." Casey shrugged. "When you have to jump across hundreds of years of space and time, don't you always take a risk?"

"Not like this one." She shrugged unhappily. "Enthel Two is toward the galactic core. So is this new one. If the killer is coming from the core—"

Pale face set, she shook her fair-haired head.

"We'll take the risk." Casey glanced again at us and gave her a stiff little grin. "You might remind him that we weren't cloned to live forever. He has more at stake than we do."

Her body stiffened, fading slowly white.

"Tling and I have begged him." Her voice was faint. "But he feels commanded."

"By his nanorobs? Can't he think of you and Tling?"

Her answer took a long time to come.

"You don't understand them." She seemed composed again; I wondered if her own nanorobs had eased her pain. "You may see them as micromachines, but they don't make us mechanical. We've kept all the feelings and impulses the primitives had. The nanorobs simply make us better humans. Sandor is going not just for the colonists, but for me and Tling, for people everywhere."

"If the odds are as bad as they look—" Casey squinted doubtfully. "What can one man hope to do?"

"Nothing, perhaps." She made a bleak little shrug. "But he has an idea. Long ago, before he ever left Earth to search for his brother, he worked with his mother on her nanorob research. He has reprogrammed himself with the science. If the killer is some kind of virulent organism, he thinks the nanorobs might be modified into a shield against it."

"Speak to him," Casey begged her. "Get him to take us with him. We'll help him any way we can."

"You?" Astonishment widened her eyes. "How?"

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"We put you here on Earth," he told her. "Even with no nanorobs at all."

"So you did." Golden color flushed her skin. "I'll speak to him." Silent for a moment, she shook her head. "Impossible. He says every seat on the ship is filled."

She paused, frowning at the ceiling. The robot was moving around the table, offering a bowl of huge flesh-colored mushrooms that had a tempting scent of frying ham.

"We are trying to plan a future for Tling." Her face was suddenly tight, her voice hushed with feeling. "A thousand years will pass before he gets back. He grieves to leave Tling."

"I saw her this morning," I said. "She's terribly hurt."

"We are trying to make it up. I've promised that she will see him again."

Pepe looked startled. "How can that happen?"

She took a mushroom, sniffed it with a nod of approval, and laid it on her plate.

"We must plan the time," she told him. "Tling and I will travel. I want to see what the centuries have done to my own homeworld. It will take careful calculation and the right star flights, but we'll meet him back here on the date of his return."

"If—"

Casey swallowed his voice. Her face went pale, but after a moment she gave us a stiff little smile and had the robot offer the mushrooms again. They had a name I never learned, and a flavor more like bittersweet chocolate than ham. The meal ended. She left us there alone with the robots, with nowhere to go, no future in sight.

"A thousand years!" Pepe muttered. "I wish we had nanorobs."

"Or else—"

Casey turned to the door.

"News for you." Lo stood there, smiling at us. "News from the emigrant ship. Uneasy passengers have arranged for new destinations, leaving empty places. Sandor has found seats for you."

7.

Sandor took us to our seats on the emigrant ship. Wheel-shaped and slowly spinning, it held us to the floors with a force weaker than Earth's gravity, stronger than the Moon's. A blue light flashed to warn us of the space-time slide. Restraints folded around us. I felt a gut-wrenching tug. The restraints released us. With no sense of any other change, we sat uneasily waiting.

The big cabin was hushed. Watching faces, I saw eager expectation give way to disappointment and distress. I heard a baby crying, someone shouting at a robot attendant, then a rising clamor of voices at the brink of panic. Sandor sat looking gravely away till I asked him what was wrong.

"We don't know." He grinned at our dazed wonderment. "At least we've made the skip to orbit. Five hundred light-years. You're old men now."

He let us follow him to the lounge, where a tall ceiling dome imaged a new sky. The Milky Way looked familiar. I found the Orion Nebula, but all the nearer stars had shifted beyond recognition. I felt nothing from the ship's rotation; the whole sky seemed to turn around us. Two suns rose, set close together. One was yellow, smaller and paler than our own, the brighter a hot blue dazzle. The planet climbed behind them, a huge round blot on the field of unfamiliar stars, edged with the blue sun's glare. Looking for the glow of cities, all I saw was darkness.

Anxious passengers were clustering around crew members uniformed in the ship's blue-and-gold caps and sashes. Most of their questions were in the silent language of the nanorobs, but their faces revealed dismay. I heard voices rising higher, cries of shock and dread.

We turned to Sandor.

"The telescopes pick up no artificial lights." His lean face was bleakly set.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"Radio calls get no answer. The electronic signal spectrum appears dead." He shook his head, with a heavy sigh. "I was thinking of my brother. I'd hoped to find him here."

With gestures of apology to us, uneasy people pushed to surround him. He looked away to listen, frowning at the planet's dark shadow, and turned forlornly to go. He spoke his final words for us.

"We'll be looking for survivors."

We watched that crescent of blue-and-orange fire widen with each passage across the ceiling dome till at last we saw the planet's globe. Swirls and streamers of high cloud shone brilliantly beneath the blue sun's light, but thick red dust dulled everything under them.

One hemisphere was all ocean, except for the gray dot of an isolated island. A single huge continent covered most of the other, extending far south of the equator and north across the pole. Mountain ranges walled the long west coast. A single giant river system drained the vast valley eastward. From arctic ice to polar sea it was all rust-red, nothing green anywhere.

"A rich world it must have been." Sandor made a dismal shrug. "But now—"

He turned to nod at a woman marching into the room. A woman so flat-chested, masculine, and strange that I had to look twice. Gleaming red-black scales covered her angular body, even her hairless head. Her face was a narrow triangle, her chin sharply pointed, her eyes huge and green. We stared as she sprang to a circular platform in the center of the room.

"Captain Vlix," he murmured. "She's older than I am, born back in the days when nanorobs were new and body forms experimental. I sailed with her once. She remembered my brother asking if she knew me. That was Earth centuries ago. She had no clues to give me."

Heads were turning in attention. I saw uneasy expectation give way to bitter disappointment. Sandor stood frozen, widened eyes fixed on her, till she turned to meet another officer joining her on the platform. They conferred in silence.

"What is it?" Casey whispered. Sandor seemed deaf till Casey touched his arm and asked again, "What did she say?"

"Nothing good." Sandor turned to us, his voice hushed and hurried. "She was summing up a preliminary report from the science staff. This dead planet is the second they have reached. The other was two hundred light-years away. The implications—"

He hunched his shoulders, his skin gone pale.

"Yes? What are they?"

With a painful smile, he tried to gather himself.

"At this point, only speculation. The killer has reached two worlds. How many more? Its nature is not yet known. The science chief suggests that it could possibly be a malignant nanorob, designed to attack all organic life. It is certainly seems aggressive, advancing on an interstellar front from the direction of galactic core."

"What can we do?"

"Nothing, unless we come to understand it." He glanced at the captain and spread his empty hands. "Nanorobs are designed to survive and reproduce themselves. They are complex, half alive, half machine, more efficient than either. The early experimenters worked in terror of accident, of creating something malignant that might escape the laboratory. This could be a mutation. It could be a weapon, reprogrammed by some madman—though his own nanorobs should have prevented that."

He looked again at the captain, and slowly shook his head.

"The officers are doing what they can. A robotic drone is being prepared to attempt a low-level survey of surface damage. A search has already begun for any

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

spacecraft that might remain in orbit. And—"

He broke off to watch a thin man with a gray cap and sash who darted out of the crowd and jumped to join the officers on the platform.

"That's Benkar Rokehut." He made a wry face. "A fellow Earthman, born in my own century. A noted entrepreneur, or perhaps I should say gambler. Noted for taking unlikely chances. He has opened half a dozen worlds, made and lost a dozen fortunes. He funded the initial surveys and settlements here. He has a fortune at stake."

His golden shoulders tossed to an ironic shrug.

"He may love wild chances, but he doesn't want to die."

Rokehut faced the captain for a moment, and turned silently to address the room. Gesturing at the planet, pointing at features on the surface, he kept turning to follow as it crept overhead, kept on talking. When Captain Vlix moved as if to stop him, he burst suddenly into speech, shouting vehemently at her, his pale skin flushing redder than the planet.

"His emotions have overcome his nanorobs." Sandor frowned and drew us closer. "All he sees is danger. Though that first lost planet is two hundred light-years from this one, they both lie toward the Core from Earth. He believes the killer pathogen is spreading from somewhere toward the Core, possibly carried by refugees. He wants us to head out for the frontier stars toward the Rim."

The officers moved to confront him. What they said was silent, but I saw Rokehut's face fade almost to the gray of his cap and sash. He snatched them off, threw them off the platform, waved his fists and shouted. Yielding at last, he shuffled aside and stood glaring at Captain Vlix, his fists still clenched with a purely human fury.

She turned silently back to face the room, speaking with a calm control.

"The officers agree that we do seem to face an interstellar invasion." Sandor spoke softly. "But blind flight can only spread the contagion, if panicky refugees carry it. In the end, unless we get some better break—"

With a sad little shrug, he paused to look hard at us.

"Tycho Station could become the last human hope. It is sealed, shielded, well concealed. The Moon has no surface life to attract or sustain any kind of pathogen." His lips twisted to a quirk of bitter humor. "Even if it wins, there's hope for humanity. It should die when no hosts are left to carry it. You clones may have another book to write before your epic ends."

Captain Vlix left the room, Rokehut and his people close behind her. The robot attendants were circulating with trays of hard brown biscuits and plastic bubbles of fruit juice.

"The best we can do," Sandor said. "With zero times in transit, the ship carries no supplies or provisions for any prolonged stay aboard. We must move on with no long delay, yet the officers agree that we must wait for whatever information we can get from the drone."

It descended over the glaciers that fringed the polar cap and flew south along the rugged west coast. Its cameras projected their images on the dome and the edge of the floor. Standing there, I could feel that I was riding in its nose. It must have flown high and fast, but the images were processed to make it seem that we hovered low and motionless over a deserted seaport or the ruin of a city and climbed to soar on to the next.

All we saw was dust and desolation. Broken walls of stone or brick, where roofs had fallen in. Tangles of twisted steel where towers had stood. Concrete seawalls around empty harbors. And everywhere, wind-drifted dunes of dead red dust and wind-whipped clouds of

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

rust-colored dust, sometimes so dense it hid the ground.

The drone turned east near the equator, climbing over mountain peaks capped with snows dyed the color of drying blood. It paused over broken dams in high mountain canyons and crossed a network of dust-choked irrigation canals.

"I've dreamed of my brother." Sandor made a solemn face. "Dreamed I might find him here." He stopped to sigh and gaze across an endless sea of wave-shaped dunes. "Dreams! All of us dreaming we had endless life and time for everything. And now—"

The drone had reached the dead east coast and flown on across the empty ocean. The lounge was silent again, disheartened people drifting away. Casey asked if we were turning back.

"Not quite yet." Sandor tipped his head, listening. "Captain Vlix reports that the search team has found something in low polar orbit. Maybe a ship. Maybe just a rock. Maybe something else entirely. She's launching a pilot pod to inspect it."

Music had lifted back in the lounge, its unfamiliar trills and runs and strains broken by long gaps of nothing I could sense. A woman with a baby in her arms was swaying to a rhythm I couldn't hear. Silent people were dozing or wandering the aisles. A silent group had gathered around Rokehut at the end of the room, frowning and gesticulating.

"He still wants us to run for our lives," Sandor said. "For a star two thousand light-years out toward the Rim. An idiot's dream! To complete the slide he'd have to calculate the exact relative position of the star two thousand years from now. He has no data for it."

The attendants came back with juice and little white wafers. Rokehut and his group refused them, with angry gestures, and trooped away to confront the captain again.

"A mild sedative." Sandor waved the robot away. "If you need to relax."

I accepted a wafer. It had a vinegar taste and it hit me with a sudden fatigue. I slept in my seat till Casey shook my arm.

"The pod has reached that object in orbit," Sandor told us. "The pilot identifies it as the craft that brought the last colonists. His attempts at contact get no response. Rokehut has offered him a fortune to go aboard. Permission has been granted, with the warning that he won't be allowed back on our ship. He reports that his service robot is now cutting the security bolts to let him into the airlock."

I watched the people around us, silently listening, frowning intently, expectantly nodding, frowning again.

"He's inside." Head tipped aside, eyes fixed on something far away, Sandor spoke at last. "The pathogen got there ahead of him. He has found red dust on the decks, but he hopes for protection from his space gear. He believes the killer was already on the planet before the ship arrived. The cargo was never unloaded. All organics have crumbled, but metal remains unchanged.

"He's pushing on—"

Sandor stopped to listen and shake his head.

"The pilot was on his way to the control room, searching for records or clues. He never got there." He leaned his head and nodded. "The science chief is summing up what evidence he has. It points to something airborne, fast-acting, totally lethal. It must have killed everybody who ever knew what it is."

Captain Vlix allowed Rokehut and his partisans to poll the passengers. Overwhelmingly, they voted to turn back toward Earth at once. The lounge became a bedlam of angry protest when departure was delayed, hushed a little when Captain Vlix came back to the platform.

"She says Earth is out," Sandor told us,

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"for two sufficient reasons. We might find that the pathogen already there. Even if we found it safe, she says we would certainly be regarded as a suspected carrier, warned away and subject to attack if we tried to make any contact."

"That recalls a legend of the old Earth." Casey nodded bleakly. "The legend of a ghost ship called the Flying Dutchman, that sailed forever and never reached a port."

The strange constellations flickered out of the ceiling dome, and the drone's images returned. The limitless ocean beneath it looked blue as Earth's when we glimpsed it through rifts in the clouds, but the sky was yellow, the larger sun a sullen red, the blue one now a hot pink point.

"The island's somewhere ahead." Sandor stood with us in the lounge, frowning at the horizon. "If we ever get there. It's losing altitude. Losing speed. Probably damaged by the dust."

White-capped waves rose closer as it glided down through scattered puffs of cumulus.

"There it is!" Sandor whispered before I had seen it. "Just to the right."

I strained to see. The image dimmed and flickered as the drone bored through a tuft of pink-tinted cloud. Something blurred the far horizon. At first a faint dark streak, it faded and came back as we searched it for color.

"Green?" A sharp cry from Casey. "Isn't it green?"

"It was," Sandor said. "We're going down."

A foam-capped mountain of blue-green water climbed ahead of the drone. It crashed with an impact I almost felt, but I thought I had caught a flash of green.

8.

The ceiling dome had gone dark when the drone broke up. After a moment it was spangled again with those new constellations. The dead ship, immense and high overhead, was a fire-edged silhouette against the Milky Way.

"You saw it!" Casey shouted at Sandor. "Something green. Something alive!"

Frowning, Sandor shook his head.

"I saw a brief greenish flash. Probably from some malfunction as the drone went down."

"It was green," Casey insisted. "Aren't they landing anybody to take a look?"

"No time for that."

"But if the island is alive—"

"How could that be?" He was sharply impatient. "We've seen the whole planet dead. Whatever killed it killed the drone before it ever touched the surface. The captain isn't going to risk any sort of contact."

"If she would let us land—" Casey waited for Pepe and me to nod. "We could radio a report."

"Send you down to die?" Sandor's eyes went wide. "She cares too much for life. She would never consider it."

"Don't think we care for life? Tell her we were cloned to keep the Earth and humankind alive. But tell her we were also cloned to die. If we must, I don't know a better way."

Sandor took us to meet Captain Vlix, and translated for us. Our visit was brief, but still enough to let me glimpse a spark of humanity beneath her gleaming crimson scales. I don't know what he told her, but it caught her interest. She had him question us about Tycho Station and our lives there.

"You like it?" Her huge green eyes probed us with a disturbing intensity. "Life without nanorobs? Knowing you must die?"

"We know." Casey nodded. "I don't dwell on it."

"I must admire your idealism." A frown creased her crimson scales. "But the science staff reports no credible evidence of life on the planet. I can't waste your lives."

"We saw evidence we believe," Casey

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

said. "In that last second as the drone went down. Considering the stakes, we're ready to take the risk."

"The stakes are great." Her eyes on Sandor, she frowned and finally nodded her red-scaled head. "You may go."

There were no space suits to fit us. That didn't matter, Casey said; space gear had not saved the pilot who boarded the derelict. With Sandor translating, the service robots showed Pepe how to operate the flight pod, a streamlined bubble much like the slider that had brought Sandor to the Moon. He shook our hands and wished us well.

"Make it quick," he told us. "Captain Vlix expects no good news from you. No news at all, in fact, after you touch down. Our next destination is still under debate. None looks safe, or satisfies everybody, but we can't delay."

Pepe made it quick, and we found the island green.

Rising out of the haze of dust as we dived, the shallow sea around it faded from the blue of open water through a hundred shades of jade and turquoise to the vivid green of life. The island was bowl-shaped, the great caldera left by an ancient volcanic explosion. Low hills rimmed a circular valley with a small blue lake at the center. A line of green trees showed the course of a stream that ran through a gap in the hills from the lake down to the sea.

"Kell?" Sandor's voice crackled from the radio before we touched the ground. "Navarro? Yare? Answer if you can."

"Tell him!" Casey grinned at Pepe as he dropped our slider pod to a wide white beach that looked like coral sand. "It looks a lot better than our pits in the Moon. No matter what."

Pepe echoed him, "No matter what."

"Tell him we're opening the air lock," Casey said. "If we can breathe the air, we're heading inland."

Pepe opened the air lock. I held my breath till I had to inhale. The air was fresh and cool, but I caught a faint acrid bite. In a moment my eyes were burning. Pepe sneezed and clapped a handkerchief over his nose. Casey smothered a cough and peered at us sharply.

"Can you report?" Sandor's anxious voice. "Can you breathe?"

Casey coughed and blew his nose.

"Breathing," he gasped. "Still breathing."

I thought we were inhaling the pathogen. I hadn't known the pilot who died on the derelict, or the millions or billions it had killed. I felt no personal pain for them, but Pepe and Casey were almost part of me. I put my arms around them. We huddled there together, sneezing and wheezing, till Pepe laughed and pulled away.

"If this is death, it ain't so bad." He jogged me in the ribs. "Let's get out and take a closer look."

We stumbled out of the lock and stood there on the hard wet sand beside the pod, breathing hard and peering around us. The sky was a dusty pink, the suns a tiny red moon eye and a bright pink spark. The beach sloped up to low green hills. Perhaps half a mile south along the beach, green jungle covered the delta at the mouth of the little river. Pepe picked up a scrap of seaweed the waves had left.

"Still green." He studied it, sniffed it. "It smells alive."

My lungs were burning. Every breath, I thought, might be my last, yet I always stayed able to struggle for another. Pepe dropped the handkerchief and climbed back in the slider to move it higher on the beach, farther from the water. He returned with a portable radio. Casey blew his nose again, and started south along the beach, toward the delta. We followed him, breathing easier as we went.

The little river had cut its way between two great black basaltic cliffs. Casey stopped before we reached them, frowning up at the nearest. I looked and caught a deeper breath. The summit had been carved into a face. The unfin-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ished head of a giant struggling out of the stone.

"Sandor!" Casey walked closer, staring up at the great dark face. "It's Sandor."

"It is." Shading his eyes, Pepe whispered huskily. "Unless we're crazy."

I had to sneeze again, and wondered what the dust was doing to us.

Sandor called again from the ship, but Pepe seemed too stunned to speak. A rope ladder hung across the face, down to the beach. Black and gigantic, gazing out at the sky, lips curved in a puckish smile, the head was certainly Sandor's.

"We're okay." Rasping hoarsely into the phone, Pepe answered at last. "Still breathing."

Walking closer to the cliff, we found a narrow cave. A jutting ledge sheltered a long workbench hewn from an untrimmed log, a forge with a pedal to work the bellows, a basket of charcoal, a heavy anvil, a long shelf cluttered with roughly-made hammers and chisels and drills.

"The sculptor's workshop." Casey stepped back across a reef of glassy black chips on the sand, litter fallen from the chisel. "Who is the sculptor?"

He touched his lips at Pepe when Sandor called again.

"Tell him to hold the ship. Tell him we're alive and pushing inland. Tell him we've found human life, or strong evidence for it. But not a word about the face. Not till we have something Captain Vlix might believe."

We hiked inland, following a smooth-worn footpath along the river bank. The valley widened. We came out between two rows of trees, neatly spaced, bearing bright red fruit.

"¡Cerezas!" Pepe cried. "Cherries! A cherry orchard."

He picked a handful and shared them, tart, sweet, hard to believe. We came to an apple orchard, to rows of peach and pear trees, all laden with unripe fruit. We found a garden farther on, watered by a narrow ditch that diverted water from the river. Tomato vines, yams, squash, beans, tall green corn.

Casey caught his breath and stopped. I stared past him at a man—a man who might have been Sandor's double—who came striding up the path to meet us.

"Sandor?" His eager voice was almost Sandor's, though the accent made it strange. "Sandor?"

We waited, hardly breathing, while he came on to us. The image of Sandor, bronzed dark from the sun, he had the same trim frame, the same sleek brown fur crowning his head, the same pixie face and golden eyes. He stopped to scan us with evident disappointment, and pointed suddenly when he saw Pepe's radio.

Pepe let him have it. Eagerly, hands shaking, he made a call. The other Sandor answered with a quick and breathless voice. Their excited words meant nothing to me, no more than their silent communion after they fell silent, but I could read the flow of feeling on the stranger's weathered face. Wonder, fear, hope, tears of joy.

At last the Sandor on the ship had a moment for us.

"You've found my brother. Call him Corath if you need a name. Captain Vlix is ready for a jump toward the Rim. She is slow to believe what you're saying, with her ship at risk, but Rokehut is demanding a chance for confirmation and I must see my brother. She's letting me come down."

Corath beckoned. We followed him down the path till we could see the distant lake and a ruined building on a hill. Once it must have been impressive, but the stone walls were roofless now, windows and doorways black and gaping. He stopped us at his very simple residence, a thatched roof over a bare wooden floor with a small stone-walled enclosure at the rear. Waiting for Sandor, we sat at a table under the thatch.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

He poured cherry wine for us from a black ceramic jug and stood waiting, staring away at the sky.

Sandor landed his silvery flight pod on the grass in front of the dwelling. Corath ran to meet him. They stopped to gaze at each other, to touch each other, to grip each other's hands. They hugged and stepped apart and stood a long time face to face without a word I could hear, laughing and crying, hugging again, until at last Sandor rubbed his wet eyes and turned to us.

"I saw—saw the head." Breathing hard, he stopped to clear his throat and peer again into Corath's face as if to verify that he was real. "It was meant to be my own, though at first I thought it was his. He has been here almost two hundred years, marooned by the pathogen. With no way to search for me, he says, except inside the mountain."

A spasm of coughing bent him over. Corath held his arm till he drew himself upright and turned soberly back to us.

"We were coughing," Pepe said. "Sneezing. Wheezing. We thought we had the killer pathogen."

"Something kin to it, my brother says. But benign. He says it saved your lives."

We had to hold our questions. They forgot us, standing together a long time in silence before they laughed and embraced again. Sandor wiped at his tears at last and turned back to us.

"The pathogen got here two hundred years ago. Corath knows no more than we do about its origin or history. It caught him here on the island, at work on the same sort of nanorob research I once hoped to undertake. He was testing immunities and looking for quantum effects that might extend the contact range. The range effect is still not fully tested, but his new nanorob did make him immune. Too late to save the rest of the planet, it did wipe the pathogen off the island."

Captain Vlix was still a stubborn skeptic, terrified of contamination. She refused to let Sandor bring his brother aboard, or even to come back himself. Yet, with Rokehut and some of the other passengers still at odds over a new destination, she let the second officer bring a little group of desperate volunteers down to see the live island for themselves.

They came off the pod jittery and pale. Fits of coughing and sneezing turned them whiter still, until Corath and his news of their new immunity brought their color back. To make his own survival sure, the officer drew a drop of Corath's blood and scratched it into his arm with a needle. Still breathing, but not yet entirely certain, he wanted to see the research station.

Corath took us to tour the ruin on the hill. The pathogen had destroyed wood and plastic, leaving only bare stone and naked steel. A quake had toppled one roofless wall, but the isolation chamber was still intact. An enormous windowless concrete box, it had heavy steel doors with an airlock between them.

Black with rust, the doors yawned open now, darkness beyond them. He struck fire with flint, steel, and tinder, lit a torch, led us inside. The chamber was empty, except for the clutter of abandoned equipment on the workbenches and a thick carpet of harmless gray dust on the floor.

We found nothing to reveal the structure of his new nanorob, nothing to explain how its wind-borne spores had set us to sneezing and made us safe. Corath answered with only a noncommittal shrug when Pepe dared to ask if the infection had made us immortal.

"At least the dust hasn't killed us," Casey said. "Good enough for me."

The officer went back to the ship with a bottle of Corath's healing blood. Captain Vlix agreed to hold the ship in orbit. Rokehut brought his engineers to survey the island and stake out a settlement site on the plateau beyond the lake. Passengers came down with their luggage and crates of freight, ready now

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

to stake their futures on the island and Corath's promise that the red dust could make fertile soil.

He decided to stay there with them.

Sandor took us with him back aboard. Convinced at last, Captain Vlix was waiting to greet us at the airlock, embracing him almost as tearfully as his brother had. When she had finally wiped her eyes and turned away, he spoke to us.

"Our job now is to fight the pathogen with Corath's nanorob. Volunteers in flight pods are setting out to carry it to all the nearest worlds. I am taking it to Lo and Tling back on Earth. Do you want to come?"

We did.■

Chat Online
with your favorite authors!

Dark Matter **October 24 @ 9:00 p.m. EST**
A Century of Speculative Fiction from the African Diaspora. Steven Barnes, Tananarive Due, Nalo Hopkinson, Nisi Shawl, Linda Addison, and Sheree R. Thomas.

Robert Jordan **November 14 @ 9:00 p.m. EST**
on *Winter's Heart.*

Peter F. Hamilton **November 28 @ 9:00 p.m. EST**
author of *The Naked God.*

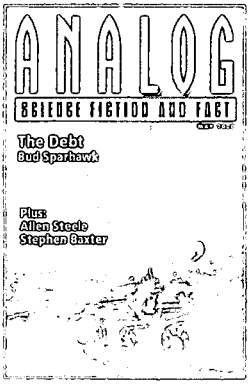
Go to **www.scifi.com/chat** or link to the chats via our home page (**www.analogsf.com**). Chats are held in conjunction with *Asimov's Science Fiction* and the Sci-fi Channel and are moderated by *Asimov's* editor, Gardner Dozois.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

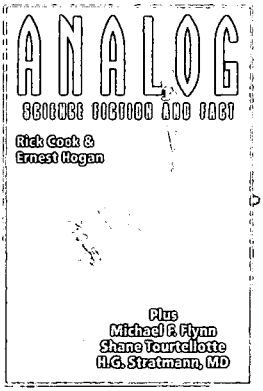
TOUR THE UNIVERSE

Just $6.95!

Save 60%



Explore the boundaries of imagination with the Analog Science Fiction Value Pack. You get five of our most popular back issues for just $6.95 plus shipping. That's a savings of 60% off the regular price!



Complete the order form below and mail it back to us with your payment today.

PENNY MARKETING

Dept. SM-100, 6 Prowitt Street, Norwalk, CT 06855-1220

☑ YES! Please send me my **Analog Science Fiction Value Pack.** I get 5 back issues for just $6.95 plus $2 shipping and handling ($8.95 per pack, U.S. funds). **My satisfaction is fully guaranteed!** My payment of $ _____ is enclosed.
(AFPK05)

Name: _____
(Please print)

Address: _____

City: _____

State: _____ **ZIP:** _____

Please make checks payable to Penny Marketing. Allow 8 weeks for delivery. Magazines are back issues shipped together in one package. To keep prices low we cannot make custom orders. Add $4 additional postage for delivery outside the U.S.A. Offer expires 12/31/01. 090C-NANVL1

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Change is usually frightening, but appropriate response requires more than fear. Looking at the record, for instance . . . .

Summer's Lease

J.R. Dunn

. . . hath all too short a date.
—Shakespeare, Sonnet 18

Fear has always been the major driver in environmental crises. Fear that the great mistake has been made at last, that nature has been pushed too far, that there is no dodging the bullet this time. Overpopulation, resource depletion, the long-term effects of pollution—all were unprecedented, their course unknown, the possibilities terrifying. Who could blame overreaction in dealing with them?

At first sight, global warming appears little different from earlier threats. The fears are certainly there, with new reports appearing almost daily: "Global Warming Has Helped Spread Disease," "Warmer Seas Breed Coral-Killing Virus," "Last Decade Hottest of the Millennium." (Nor has it been overlooked in SF, as any reader of *Analog* is well aware.) A major international treaty dealing with the problem has been signed (but not ratified by the U.S.). Fundamental changes are being suggested on all levels of the global order, with the approval of at least one serious presidential candidate. All this without the slightest recognition that climatic warming is not at all unprecedented, its effects by no means unknown, and its course far from disastrous.

CLIMATE WITHOUT SWEAT

There's a tendency to put climate in the same mental compartment as geology or astronomy: a continuum in which little or no change occurs in human or historical terms. Given that framework, any appreciable climatic shift takes on the character of a calamity, on the order of an earthquake or asteroid strike.

In truth, climate is weather writ long, subject to transitions and variations from a number of causes, a point adequately confirmed by the term "ice age". Or perhaps not so adequately, since the scale remains too vast. No small part of

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

human history has been affected by climatic shifts, sometimes subtle, sometimes dramatic. These shifts are consistently accompanied by changes in temperature, one of the major climatic variables.

Since the end of the last glacial period, the Wisconsin Stage (or Würm Stage, as it's called in Europe) 6 to 7,000 years ago, Earth's climate has shifted repeatedly, with temperature variations looking (very) roughly like this:

- A hot period, the Climatic Optimum (or the Holocene Optimum), between 6 to 5,000 and 3,000 B.C.
- A prolonged cooling (spiked by several warming episodes) through the second millennium B.C., leading to a cold period from 900 to 300.
- A cool period from 300 B.C. to A.D. 750, with a short warming between A.D. 300 and 400.
- Another lengthy warm period from 750 to 1215 called the Little Climatic Optimum (or Medieval Warming Period).

Debate exists about details and dates. Some climatologists see a drought following the A.D. 300 warming, ameliorated by an increase in rainfall beginning around 800. In the absence of precise records, paleoclimatology utilizes "proxy measures"—pollen counts, ice cores, lake levels, the extent of peat bogs—to estimate average temperature. In North America, dendroclimatology, the examination of tree rings, has proven extremely accurate. In Europe trees are unreliable and instead glaciology, the study of glacier deposits, fills the role. The above record is derived from European glaciers (much of it from the Fürnau glacier in the Tyrol). While often enough different sources correspond, they're still estimates. All the same, no serious argument exists concerning the general outline across the centuries and millennia, including our chief point of interest, that last major warming episode, the Little Climatic Optimum (LCO).

Climatic conditions during the LCO were both milder and drier than today, with an average temperature increase of 1 to 2 degrees. (Two to four Fahrenheit—the scale we'll use throughout—in Greenland; a greater effect at higher latitudes, as predicted by several current warming models). Winter temperatures were up to 3.5 degrees higher, also suggested by current research. Warming appears to have been worldwide. There's no agreement as to cause, though there are plenty of theories, including a shift of Earth's axial tilt, changes in global wind cycles, passage out of a galactic dust cloud, and variations in solar output.

What were the effects? According to today's predictions, we'd find the Four Horsemen unbound: unusual and destructive weather patterns including more frequent and intense storms and longer, more severe droughts; rises in sea level; disruption of agriculture leading to famine; the stressing of local ecosystems, resulting in mass migration of animals (particularly insects); the extinction of marginal species; the introduction of new plagues.

The record shows otherwise. The major threat in the LCO didn't come from horsemen at all, it seems, but from men in boats.

WHAT THE VIKINGS FOUND

During the LCO, ice effectively vanished from the northern seas, with icebergs rarely seen below the 70th parallel (roughly the line of the North Cape and Point Barrow). Weather underwent a general moderation, with storms few and feeble and seas tranquil. The resulting ease of navigation allowed northern routes to be crossed in craft little larger than lifeboats, not a trick you'd want to attempt today. (During World War II, Allied convoys cruising the same waters were often saved from U-boat attacks by mountainous seas that prevented subs from closing.)

The Viking Movement has long en-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

joyed the status of legend: the early raids, the settlements and conquests, the new kingdoms, and most impressive of all, the discoveries. By the end of the first millennium the Vikings had explored the entire North Atlantic through private expeditions by tribes or families, an achievement excelled only by the Polynesians, sailing a very different and much calmer ocean.

Iceland, settled in 874, was the major Viking colony, serving as a base for expeditions further west. In 982, Erik "the Red" Thorvaldsson was exiled for killing a man and sailed from Iceland for an unknown landmass barely visible on the horizon on very clear days. (He had a bad reputation for that kind of behavior: he couldn't return home due to an earlier murder in Norway.) Accompanying him were his three sons, Leif, Thorvald, Thorstein, and one daughter, Freydis.

Three years later, Erik returned to Iceland to organize a colonizing expedition. In 986, he led fourteen ships and 350 colonists to found a settlement called Brattahild at Eiriksfjord on Greenland's southwestern coast. A second settlement soon followed. The colony wasn't much by our standards, though impressive for the medieval period. The population rose to 3,000 by the end of the 12th century, with 380 farms, twelve churches, a monastery, a nunnery, and a cathedral at Gardar.

It was the son of a Greenland colonist, Bjarni Herjolfsson, who actually discovered America. After going off course in a fog, he came across a flat, wooded shoreline the like of which he'd never before seen. For reasons known only to himself, Herjolfsson kept quiet for twelve years. (It's difficult to imagine why—Greenland lacked trees, requiring import of lumber for building. The last voyage to North America prior to Columbus in 1347 involved just such a lumber run.)

Leif heard of Bjarni's voyage while in Norway, and on returning to Greenland (either in 995-6 according to Farley Mowat, 1001-2 according to Samuel Eliot Morison, or 1003-4 in the Tale of the Greenlanders) mounted an expedition to the unknown shore.

Viking travels in North America can be traced thanks to a geological feature in Markland ("Wooded Land," modern Labrador) that Leif the called the Furdustrand ("Wonder Strand"), a beach of white sand bordered by dense woodland forty miles (Morison says thirty) long and in places 200 feet wide. The beach still exists, and references to it (along with several less impressive geological features) in the two pertinent Viking sagas reveal a fairly accurate itinerary. By this means, the major Viking settlement was located at L'Anse-aux-Meadows in 1960.

It was there that the Vikings found grapes. Some historians insist these were currants, gooseberries, or wild cranberries, anything to avoid admitting that grapes could have grown naturally so far north. (Another now-discredited school took them as evidence that the Vikings sailed further south than they actually did.) But their discoverer was a German named Tykir, who knew what grapes looked like. Nothing brings home the effects of warming more than the fact that Newfoundland was once called "Vinland."

Viking policy of killing anything they came across worked against them in the New World. The Skraelings ("screechers" or "uglies") were too numerous and, as many a settler was to discover in centuries to come, not overawed by the fighting abilities of the white man. It was the Indians, not the cold, that chased the Vikings out of Vinland the Good. The next wave of exploration five centuries later concentrated on the southern route, far from the ice and storms of the chilly North Atlantic.

A PLACE IN THE SUN

Skepticism about the testimony of Serbs with battleaxes is easily excused. But the LCO was not a limited phenom-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

enon, and records of its effects in Europe are, if anything, even more compelling than the sagas.

The Middle Ages are often viewed as an epoch of stolid peasants stumping back and forth with shouldered hoe, exploited by the nobility while the clerks look on. While this picture is still occasionally encountered in works such as William Manchester's *A World Lit Only by Fire*, serious studies of the High Middle Ages since the 1970s have revealed a different story: a Europe that was no stagnant backwater but the focus of two large-scale social advances—the European Agricultural Revolution and what may as well be called the First Industrial Revolution.

Little known outside professional historical circles, the European Agricultural Revolution is one of the key events in the history of the West, and by extension the human race as a whole. Centered on the fertile and unexploited northern European plains, utilizing new techniques, crops, and equipment, this revolution completely transformed the fundamental enterprise of raising foodstuffs.

For many years it was believed that introduction of the heavy plow, the nailed horseshoe, and the horse harness were the major factors in the new agriculture. But these were late developments. The key element was climate, specifically warming: "Progress in climatological studies in recent decades has led medieval historians to accept the fact that climate must have been one of the decisive factors in raising the level of agriculture.[1]"

Vinland had European counterparts. Vineyards were cultivated up to 300 miles north of their modern range, with England producing high-quality wines for export. Hills were plowed in Northern England that were too cool for cultivation even during the World War II emergency agricultural expansion.

Warming aided the farmer in a number of ways. Heightened temperatures caused forest lands to retreat, making clearance easier. Longer growing seasons encouraged earlier planting. Steady mild weather guaranteed larger and more certain harvests. Between the eleventh and thirteenth centuries the average European yield (the amount harvested for each measure sown) grew from 2.5 to 4, a figure not exceeded until the eighteenth century. In some areas of France that figure was doubled.

The security of generations of bountiful harvests moved the normally ultraconservative peasantry to experiment not only with new gadgets but with novel forms of planting, including three-field crop rotation, and even new kinds of crops. The introduction of legumes—peas and beans—may sound less than exciting, but quite apart from broadening the nutritional base of the European population, the new foods also widened the culinary horizons of the common people. Today it's almost incomprehensible how monotonous the diet of the ancient world was. (Consider decades of lentils and bread—or rice—highlighted by the occasional chunk of ill-cooked meat. That was about it for most of humanity.)

The population of Europe rose from 27 million in the seventh century to 70 million in 1300. But the end of famine as a serious threat had subtler effects as well: "Accumulation of surplus food made possible population growth, specialization of function, urbanization, and the growth of leisure.[2]"

Another important consequence was a shift in the focus of European civilization beginning in Carolingian times from its ancient center around the Mediterranean to the northern marches of

[1]Gimpel, P.32
[2]White, P.44

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

France and Germany. While many other effects were ephemeral, this was permanent; the cradle of Western civilization remained in the north even after the climate reverted.

THE FIRST GREAT STEPS

Free time led to thinking and tinkering. The picture of the high medieval period as a whirl of technological change is also relatively new. Jean Gimpel, one of the pioneers of medieval technological studies, attributes this to the cultural gap between liberal arts scholars and grubby engineers, a situation not unfamiliar to *Analog* readers.

One of the benefits of the cultural shift to the north was the introduction of iron into everyday life from easily-worked deposits in Germany. The smithy appeared in every village, the water mill in every town. Early advances were, naturally enough, those useful in agriculture. The inventions that followed, too simple to rise to the level of dullness but without which no industrial civilization can exist, include the compound crank, the connecting rod, and the flywheel. Higher-level devices followed: the turbine, the compass, the mechanical clock, eyeglasses. (Thanks to Fra Giordano of Pisa, who " . . . . saw the man who discovered and practiced [the new art] and talked to him," we know to within a decade or so—1270-80—when eyeglasses were invented. But Giordano forgot to mention his name!)

The High Middle Ages were also the formative epoch of modern science, the age of not only the legendary Roger Bacon, but also his mentor Robert Grosseteste, the first chancellor of Oxford, who broke with classical precepts to insist that science be based on mathematics and experimentation, and Peter of Maricourt, who put that concept into practice as the first man ever to undertake a program of planned scientific research. The appearance of the Averroist school in the early 13th century, with its emphasis on the power of reason over authority, might have led to greater things had events not intervened.

At the same time—and this is no coincidence, since the processes that encourage mechanical ingenuity and the scientific worldview also underlie political and social evolution—medieval civilization saw the disappearance of slavery, the collapse of the manor system in favor of the small farmer, the emergence of the limited-stock company, the first stirrings of industrial capitalism. And with the decentralization of financial and political power came intimations of democracy. The warm years were crucial to the rise of the West.

Effects elsewhere were similar, if not as far-reaching. In China, citrus orchards and warm-weather herbs were grown further north than at any other time, reaching their greatest extent in the 13th century. In North America, the Anasazi civilization achieved its apex. The classic period of the Anasazi, 1100 to 1300, coincides almost exactly with the peak of medieval civilization.

All this thanks to a steady, pleasant climate? No—historically, there's no such thing as a single cause. If there's anything more complex than the natural world, it's human civilization. Potential had to exist in the first place. (Note that it was in Europe, not Song China or the American Southwest, that the pivotal social revolutions occurred.) But there are such things as basic elements, and few are more basic than climate. It's hard to imagine such a train of events occurring in anything *but* a steady, mild climatic environment. Earlier warming episodes bear this out: the Holocene Optimum coincided with the spread of agriculture across Europe, and Greek civilization peaked during a rare warm period (700-500 B.C.) in the long cooling that followed.

SUMMER'S END

The essentially benign nature of warming is underlined by what hap-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

pened when the climate turned sour. By 1200, cold was already curtailing shipping in northern seas. Icebergs returned and storms increased in both frequency and fury. The last Norse ship to land at Greenland circa 1408-1410 found a dying settlement, the cattle herds vanished, the colonists eking out a meager existence from the few viable crops, the ice closing in. When English skipper John Davis arrived in 1585, he was met by Eskimos. (Also new arrivals, driven from the far north by the same cold that wiped out the Greenlanders.)

The final years in Greenland were no doubt much like what Iceland endured—terrible winters leading to famine, endemic disease, a population drop from 70,000 in 1100 to 34,000 in 1708, a consequent collapse of crude early democracy into oligarchy and monopoly. Iceland didn't fully recover until early this century.

In Europe the treeline fell 100 to 200 meters, the altitude for cultivating vineyards 220 meters. Harvests of all foodstuffs contracted, particularly those of fruits and grain. Much of this was due to an increase in rainfall. Beginning late in the 13th century, Europe was hit by storms brutal enough to flood large areas of coastline on both shores of the North Sea, including an entire Sussex port, Winchelsea, which disappeared beneath the waves in 1297. Within a few years the rains became general across Europe. In 1315 crop yields fell by a third, decreasing to half the next year. Grain prices were fixed by the king of France, which, as always, led to hoarding. The resulting famine of 1315-17 was the worst in centuries. (During the LCO, only three widespread European famines occurred, in 1125, 1197, and 1235.) Nearly 10% of the population of France and Flanders starved, with a comparable death rate elsewhere. So severe was the famine's impact that it triggered the medieval depression, which lasted for a century and a half.

Chronic hunger was a major factor in the next disaster, one of the great catastrophes of human history—the Black Death. Plague had vanished from Europe in the seventh century, retreating to its point of origin in Central Asia. Famine, and the resultant debilitation of immune systems, set the stage for a massive resurgence. It's seldom noted that there was a famine in northern Italy in 1347, the year before the plague struck.

As Barbara Tuchman has documented, the calamities of the fourteenth century had dire effects on the spirit: a shift toward the mystical and gothic, an obsession with death and decay, a retreat from the uplands of science and technology similar, though more extreme, to our own deluge of astrologers, pyramidologists, and witches following World War II. The dance of death. The witchhunts. The flagellants. (This last a direct response to the plague, born out of a pathetic conviction that if God saw men punishing themselves He would move to halt the disease.) The Church turning from its support of science and philosophy in favor of rooting out the "errors" of the Averroists and, for that matter, Roger Bacon himself. The popular image of the Middle Ages as dank, bleak, and obsessed with death and damnation arises from the years of the cooling, not the sunlit centuries that came before.

The balance of the millennium appears oddly frantic in historical terms, which probably only reflects our ignorance of earlier epochs. Climate slightly meliorated from 1350 to 1560. Then came the Little Ice Age (1560—1850), so-called due to worldwide glacial advances. Glacier surges were at times so swift as to terrify onlookers. The Mer de Glace of Mt. Blanc was exorcised three times in an effort to halt its spread, once by no less than the Bishop of Paris. More practical was the foundation of the first weather services in the early seventeenth century. (Environmental panics are not exclusive to the modern era!)

The average temperature dropped 1 to 2 degrees. Permanent year-round

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

snow covered northern Canada. Serious flooding occurred in many areas, accompanied, paradoxically, by droughts in others. Drought may well have forced the Anasazi to abandon their great cities circa 1500, while the cold drove the Iroquois south from Canada.

Around 1850 a warming trend began, lasting until the late 1930s. It was followed by a mild cooling that peaked in the mid-1970s. Things have fluctuated since then.

A COLD DESCENT

One of the most heartening of all human attributes is the fact that we can learn new things from the past. Expanding knowledge illuminates not only ourselves but our ancestors as well. They accomplished more than they knew; recorded more than they understood. The Vikings were much more than ambitious marauders, the monks and clerks more than inspired tinkers. There's a lot we can learn from them, if only we care to look.

What we have learned from the Little Climatic Optimum is this:

- Most warming took place in winter
- Most warming occurred at high latitudes
- No mother of all violent storms occurred—to the contrary, weather appears to have ameliorated worldwide
- Animal and plant species remained effectively undisturbed[3]
- No ice sheets slid into the sea (the continued existence of the "wonder strand" argues that there was no measurable rise in sea level.)
- Frequencies of famine, epidemics, and other natural disasters fell dramatically
- Most of the social and historical effects of warming (with some exceptions, the Viking raids in particular) were beneficial.

The reasons why this vast pool of data has been overlooked are neither here nor there. It should be ignored no longer. The old mindset of "panic before thinking" has had its day. More research, both on the effects of the LCO and what it reveals about possible future warming, is imperative. Historical climatology remains an arcane discipline (apart from a strange volume on "climate and race" published in the 1930s only a single major book-length study exists, Ladurie's *Times of Feast, Times of Famine*, currently out of print). It deserves more attention from both the historical and scientific communities.

The most important point is that global warming is no catastrophe. There is no necessity for panic, despair, or ill-thought-out programs with massive price tags and hazy goals. We've been through it before, and we not only endured, we thrived.

But we may not be that lucky this time around.

The day I began work on the first draft of this article, it was 24° in central New Jersey; a bit cool for this 20th-century boy, much less a Viking. Three days later it was 10°. It remained in that range for the rest of January. At the same time vast and destructive storms—the worst in nearly a decade—pummeled the Mideast. Rainfall mixed with snow exceeded thirty inches in twenty-four hours in Lebanon, and winds of over fifty mph scoured Israel and Jordan. Similar storms knocked out power and brought transport to a standstill throughout Georgia and the Carolinas. It was a near encore of what had occurred exactly a year before—the worst storms in a century across central and northern Europe, those same plains that benefit-

[3]This includes such "canary" species as oceanic coral, alleged to be dying of contemporary warming. The coral of the Great Barrier Reef existed during the High Middle Ages and went through the LCO the same as every other species. It survived. Something else is bothering the coral.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ted so vividly from the Little Climatic Optimum.

These are not epiphenomena of a warming trend. Nor is any of the "disrupted weather" of the past few years—hurricanes, droughts, unusual swoops and drops in rainfall. As we have seen, warming moderates the weather. Deteriorating weather is a result of global cooling.

In the excitement over rising CO^2 and methane levels, one element commonly neglected in warming models (which treat its output as a constant) is the most important—the Sun. There's considerable evidence that cooling episodes are correlated with drops in solar activity, like the one that seems to have been occurring since the late 1950s . . . .

But that's somebody else's article.

WORKS CONSULTED:

J.J. Crowley and G.R. North, *Paleoclimatology* (Oxford, 1991)

Jean Gimpel, *The Medieval Machine. The Industrial Revolution of the Middle Ages* (N.Y., 1976)

Jean M. Grove, *The Little Ice Age* (London, 1988)

Gwyn Jones, *A History of the Vikings* (Oxford, 1984)

J.M. Hussey, et al, *The New Cambridge Medieval History* (Cambridge, U.K., 1966—)

Emmanuel LeRoy Ladurie, *Times of Feast, Times of Famine. A History of Climate since the Year 1000* (N.Y., 1971)

Richard S. Lewis, *From Vinland to Mars. A Thousand Years of Exploration* (N.Y., 1976)

William H. McNeil, *Plagues and Peoples* (Garden City, N.Y., 1976)

Samuel Eliot Morison, *The European Discovery of North America. The Northern Voyages* (Oxford, 1971).

Gwen Schultz, *Ice Age Lost* (Garden City, N.Y., 1974)

Barbara Tuchman, *A Distant Mirror. The Calamitous 14th Century* (N.Y., 1978)

Lynn White, *Medieval Technology and Social Change* (Oxford, 1962)

When not writing SF (*This Side of Judgment, Days of Cain,* and *Full Tide of Night*) J.R. Dunn is an independent historian working as associate editor of *The International Military Encyclopedia.* He is currently completing two novels and researching an expansion of this article to book length.

MOVING?

If you want your subscription to ANALOG to keep up with you, send both your old address and your new one (and the zip codes for both, please!) to our subscription department;

ANALOG
P.O. Box 54027
Boulder, CO 80322-4027

or fill out the change-of-address form on our website:
www.analogsf.com

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

The map is not the territory—and the instruction book is not the process . . .

TCGA
ATCGATCGATCG

Snowball in Hell

Brian Stableford

Illustration by Todd Hamilton

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

From the very beginning I had a niggling feeling that the operation was going to go wrong, but I put it down to nerves. Scientific advisors to the Home Office rarely get a chance to take part in Special Branch operations, and I always knew that it would be my first and last opportunity to be part of a real Boy's Own adventure.

I calmed my anxieties by telling myself that the police must know what they were doing. The plan looked so neat and tidy when it was laid out on the map with coloured dots: blue for the lower ranks, red for the Armed Response Unit, green for the likes of yours truly and black for the senior Special Branch officers who were supervising and coordinating the whole thing. We deeply resented the fact that the reports from the surveillance team had been carefully censored, according to the sacred principle of NEED TO KNOW, but there seemed to be no obvious reason to suppose that the raid itself wouldn't go like clockwork.

"But what are they actually supposed to have *done*, exactly?" one of my juniors was reckless enough to ask.

"If we knew *exactly*," came the inevitable withering reply, "we wouldn't need to include you in the operation, would we?"

I could tell from the reports we had been allowed to see that the so-called investigation into the experiments at Hollinghurst Manor had been a committee product, and that no one had ever had a clear idea exactly what was going on. Warrants for surveillance had been obtained on the grounds that the Branch's GE-Crime Unit had "compelling reasons" to suspect that Drs. Hemans, Rawlingford, and Bradby were using "human genetic material" in the creation of "transgenic animals," but it was mostly speculation. What they really had to go on was gossip and rumour, and the rumours in question seemed to me to be suspiciously akin to the urban legends that had sprung up everywhere since the tabloids' yuck factor campaign had finally forced the government to pass stringent laws controlling the uses of genetic engineering and to set up the GE-Crime Unit to enforce them. Once it existed, the Unit had to do *something* to justify its budget, and its senior staff obviously reckoned that whatever was going on at Hollinghurst Manor had to be yucky enough to allow them to get that invaluable first goal on the great scoresheet.

It seemed to me that the whole affair had always had a faint air of surreal absurdity about it. The illegal experiments that Hemans and his fellows were alleged by rumour to be conducting were unfortunately conducive to silly jokes, ranging from lame references to flying pigs to covert references to the raid as the Boar War. Even the Home Office joined in the jokey name game; it was some idiot undersecretary who decided to code-name the "target" Animal Farm, borrowing the most popular of the derisory nicknames it had accumulated during the surveillance. It was, alas, my own people who took some delight in explaining to anyone who would listen why the people inside had allegedly taken to calling the project "Commoner's Isle". (It was because the place where the ambitious scientist had conducted his unsuccessful experiment in H. G. Wells's *The Island of Doctor Moreau* had been called Noble's Isle.) When the inspector in charge of the Armed Response Unit assured us at the final briefing that the people in the manor didn't have a snowball's chance in hell of getting past his men he couldn't understand why the men from the ministry snickered. (In *Animal Farm*, Snowball is the idealist who gets purged by the ruthless Napoleon.)

In a sense, the inspector was right. When the Animal Farmers found out that they were being raided and ran like hell they *didn't* have a snowball's chance in hell of getting past his men. Unfortunately, that didn't make them

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

stop running and give up.

The part of the plan that included me involved uniformed policemen smashing their way through the main door and making as many arrests as possible while my people went for the computers and any paper files that were still around. We didn't expect to get all the records out—we'd been told at the briefing that Hemans, Rawlingford, and Bradby would probably start crunching diskettes and reformatting hard disks as soon as they were roused from sleep—but we figured that there'd be more than enough left to salvage. They were scientists, after all; keeping backup files ought to have been second nature to them.

Unfortunately, it wasn't that simple. The Animal Farmers didn't bother with shredding and reformatting; they just torched the place. Nobody had thought to give us gas-masks, and the fumes that met us in the corridors of the manor were so foul and instantly dizzying that we should have known that they were toxic and turned back immediately. Actually, that was what most of my colleagues did. I was the only thoroughly stupid one. I kept on going, determined to get to the office that was my designated objective. It was hopeless—but it was my one and only Boy's Own adventure and I hadn't been trained to an adequate sense of self-preservation. I was just on the point of blacking out when I heard shots fired in the woods, and realised just how badly awry the operation had gone.

I would certainly have died if I hadn't been pulled out of the fume-filled corridor—and by the time my own team got around to noticing that I was missing it was far too late for *them* to do anything constructive. It was the Animal Farmers who saved me—not the scientists who had actually set up the illegal experiments, but a handful of lesser beings who'd turned back when the shooting started in the hope of finding a safer way out on the other side of the house.

I woke up with a terrible headache and stinging eyes, coughing weakly. It felt for a minute or two as though my lungs had been so badly scorched that I could no longer draw sufficient oxygen from the warm and musty air that I drew into them—but that, mercifully, was an illusion born of distress.

I managed to crack open my weeping eyes just long enough to perceive that it was too dark to see what was happening, then shut them tight and hoped that the pain would go away.

Somebody lifted my head and pressed a cup of water to my lips. I managed to take a few sips, and decided not to protest when a female voice said: "He's OK."

While I lay there collecting myself a different female voice said: "It's no good. There's no way out up there. As the fire draws air upwards our supply's being renewed via the tunnel to the old icehouse, but there's no way through the grilles. They haven't been opened in half a century and the locks are rusted solid. Hemans should have taken care of them years ago. He should have known that this would happen one day."

"There's a hacksaw in the toolbox," a male voice put in. "If we get to work right away . . . "

"They were *shooting*, Ed," the second female told him. "They're trying to wipe us out, just like Bradby always said they would. They don't even want to ask the questions, let alone hear the answers. They just want us dead. Even if we could get to the lakeside, they're probably waiting for us. We wouldn't stand a chance."

"What chance have we got if we wait here, Ali?" Ed replied. "Even if the fire burns all day tomorrow, they'll come to pick over the ruins as soon as they can. If they're still in the woods by then, they'll certainly be all around what's left of the house. The tunnel's our only chance. If we can just get to Brighton, to a crowd. Then London . . . we can pass, Ali. I know we can. We can hide."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

I wanted to tell them that nobody wanted to shoot them, that they'd be fine if they sat tight until it was safe to go upstairs and then surrendered, but I knew that they wouldn't believe me. What on earth had made them so paranoid? And why had the ARU men opened fire?

"Ed's right," said the female who'd given me the water to drink. "If they have the icehouse covered, we're dead—but all the exits upstairs will still be useless when the fire dies down. We have to start work on the grilles. Somebody ought to watch this one, though—he's not badly hurt. If he doesn't come at us, he'll give us away."

"We should have left him where he was," Ed opined, bitterly. "He's not going to be any use as a hostage, is he?"

"He wouldn't be any use as a corpse," the unnamed female retorted. "He'd just be an excuse for branding us as murderers, justifying the ethnic cleansing."

Ethnic cleaning! What on earth had Bradby been telling them? And who the hell were they, anyway? I couldn't help jumping to the obvious conclusion, but I refused to entertain it. I was supposed to be a scientist, not some sucker who'd swallow any urban legend that happened along.

"We don't know that the others who came in with him all got out," Ali pointed out.

"No, we don't," the other female admitted, "but we did know that he hadn't. If we'd left him where he went down, it *would* have been murder."

"It would have been suicide," said Ed, "But Kath's right, Ali. They'd have *called* it murder. They'll have to justify the shooting somehow."

I coughed again, partly because I needed to and partly because I wanted to remind them that I had a voice too, even if I hadn't yet obtained sufficient control of it to formulate meaningful utterances.

"You'd better stay with him, Ali," the male voice said. "If he gets aggressive, hit him with this."

At that stage, I could only guess what "this" might be—some time passed before I was able to make out that it was an axe—but I wasn't about to make any trouble. I was still trying to convince myself that I hadn't breathed in enough poison to be mortally hurt, and that I hadn't done sufficient damage to my lungs to prejudice my long-term ability to breathe. I heard two sets of feet moving away across a stone floor, and I forced myself to relax, collecting myself together by slow degrees.

Eventually, I felt well enough to begin to feel angry. I stopped being grateful for being alive and started resenting the fact that I had come so close to dying. Setting the fire had been an act of pure spite on the part of the mad scientists. People like me—law-abiding geneticists, that is—had collaborated with the Home Office in drawing up the careful legislation which presumably defined whatever the Animal Farmers were doing as unacceptable, but they had simply been too arrogant to comply with the law. On top of that, it seemed, they had taken the view that if we wouldn't countenance the research then we couldn't have the results. They had obviously decided that if they had to go to jail, they'd take all their hard-won understanding with them—and woe betide anyone who got in their way.

Once I began to get angry, I didn't stop. If Hemans and Co. really had been transplanting human genes into the embryos of pigs in order to turn out simulacra of human beings, it was unforgivable, and the murderous fire was piling injury on insult. I'd never been convinced that the Animal Farmers *had* done what Special Branch said they'd done—I'd gone through the doors of Commoner's Isle still wondering whether it was all going to turn out to be a big mistake, exaggerated out of all proportion—but the fact that the place had been torched with such alacrity suggested that they must have done *some-*

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

thing that they were desperate to conceal.

Unless, of course, that was what we were *supposed* to think. There was still a possibility that we were all being taken for a ride—that it was all a game, intended to discredit the GE-Crime Unit and the Home Office advisors before they began to get their act together.

While I lay there being angry, it occurred to me that I might be in a uniquely good position to find out exactly what the Animal Farmers were *really* up to.

When I was finally confident that I could hold a conversation, I had already formulated my plan of campaign.

"Is Ali short for Alison?" I asked. I was able to open my eyes by then, and they had accustomed themselves to the near-darkness sufficiently to let me see that the person standing guard over me was a blonde teenager, perhaps fourteen or fifteen years of age. She was too young to be a lab assistant, so I seized upon the hypothesis that she was probably someone's daughter. We had been warned that some of the live-in staff at the manor had children, but we hadn't expected them to be abandoned when the shit hit the fan.

"Alice," she informed me, stiffly.

"As in Wonderland?" I quipped, hoping to help her relax.

"As in *Through the Looking Glass*," she retorted. It didn't seem to be worthwhile asking her what the difference was.

"I'm Stephen Hitchens," I told her. "I'm not a policeman—I'm a geneticist, currently employed as an advisor to the Home Office."

"Bully for you," she said, drily. I wondered whether she might be older than she looked—maybe sixteen or seventeen—but I concluded in the end that natural insolence, like puberty, probably arrived ahead of its time nowadays.

"Why did the scientists set fire to the house, Alice?" I asked.

"Why did armed police surround it?" she countered.

"None of this is your fault, or mine," I assured her. "I was just trying to recover the records of the experiments the scientists had done. They should have made sure that you were safe before they started the fire. They're not your friends, Alice. Did your parents work for Dr. Hemans?"

"In a manner of speaking," she told me, as if relishing a hidden irony.

"What manner of speaking?" I demanded, although I could hardly help seeing the obvious implication. If she wasn't the child of someone on the staff, she had to be one of the experimental subjects—or, I reminded myself, someone *pretending* to be one of the experimental subjects.

"The kind of work you do in a sty," she replied, casually confirming the inference she must have known I'd take. "The kind of work where your pay arrives in a trough."

If it was true, then she certainly had come from Wonderland—but was it true? Wasn't it far more likely to be a lie, a carefully constructed bluff? Was it to hear this, I wondered, that I had been hauled out of the corridor and brought down here into near-darkness? Could the Animal Farmers be using me, trying to convince me that they had achieved far, far more than they had? If so, what should my policy be? Should I run with the bluff and let her make her pitch, or challenge her and refuse to believe that she was anything but what she appeared to be?

"You're telling me that you're not human?" I said, just to make sure that she wasn't just making a joke. I knew as soon as I'd said it that I'd framed the rhetorical question wrongly. What she'd actually told me was that her parents weren't human.

"Like hell I am," she said. Like Snowball in hell, I couldn't help thinking. Play along, I told myself. Find out what she has to say.

"So you think you're human," I con-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ceded. "You can certainly pass for it, probably in a far brighter light than this—but if your parents really were pigs, you must understand that other people might not see things the same way." As I said *that* I realised that her creators—or drama-coaches—must already have put it in much stronger terms. That was why Ed and Kath had been so paranoid about the possibility of being shot down—that and the fact that the ARU really had opened fire.

"I know what I see when I look in a mirror," Alice told me, perhaps to make sure that I'd understood how clever her reference to *Through the Looking Glass* was. "It's not the image itself that's important, of course—it's the fact that there's an I to see it. A human I—and I don't mean an e-y-e."

Cogito, ergo sum, she might have said, if she—or whoever had written her script—hadn't been so anxious about the need to stay viewer-friendly. I hadn't enough anger left to prevent me from wondering whether Special Branch might always have known exactly how human the Animal Farmers' experimental subjects looked, and whether their senior officers might have taken it upon themselves to decide that the ministry didn't need to know until the shooting was well and truly over. If they had, and my captors knew it—or even if they hadn't and my captors merely believed it—I might be in deeper trouble than I thought.

"What about Ed and Kath?" I asked. "Are they like you?"

"They're human," Alice assured me, in a tone that left little doubt as to what kind of human she was talking about. She was telling me, in her own perverse way, that they were the kind of humans who were made as well as born: the kind which started off as a fertilised ovum in a sow's belly before the genetic engineers got to work.

Dr. Moreau had remade beasts in his own image by means of surgery, but modern scientists had much cleverer means at their disposal—and the degree of success they might be expected to achieve was far greater. I had to remind myself again that all of this could be a bluff run by a thoroughly human child, and that I was only playing along to see how the story would go.

Alice had relaxed a little since she first started talking, but the way she held her shadowed head and the way she gripped the axe she'd been ordered to hit me with if I got out of line suggested that she wasn't about to get careless. Now that she'd made her first impression, she was busy reminding herself that she was stuck in a cellar beneath a burning building with a man who might be dangerous. All in all, philosophical discussion seemed the safest way to build a modicum of trust.

"You think you're human because you have a human mind: because you're self-aware?" I said, earnestly—trying with all my might to sound like the dull and harmless scientist I actually was (and am).

"All animals are self-aware," Alice replied, calmly. "I'm aware that I'm human. I love and respect my fellow men, no matter what the circumstances of their birth may have been."

"How do you feel about pigs?" I asked.

"I love and respect them too," she replied. "Even the ones which aren't human. I don't eat pork—or any other meat, come to that. How do you feel about pigs, Dr. Hitchens?"

I eat pork. I also eat bacon, and all kinds of other meat, but it didn't seem diplomatic to talk about that. "I don't think pigs are human, Alice," I told her. "I don't think they can become human, even with the aid of transplanted genes."

Her answer to that certainly wasn't the kind of answer I'd have expected from an ordinary teenager, or even an extraordinary one. "How did humans become humans, Dr. Hitchens?" she asked me. "A handful of extra genes,

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

obligingly delivered up by mutation, do you suppose? Perhaps—but perhaps not. Just because a human and a chimpanzee only share ninety-nine per cent of their genes, it doesn't necessarily follow that the variant one per cent are solely responsible for the differences. Even if they are, it's not a matter of different protein-making stocks. It's a matter of *control*. The one per cent is almost entirely homeotic." She might have been parroting something Hemans or one of his coworkers had said, but I didn't think so. She seemed confident that she was making sense, and that she understood the import of her argument—but she hesitated, just in case I didn't.

"Go on," I said, interestedly. The invitation was enough to set her off with the bit between her pearly, neatly-aligned teeth.

"Most of what it took to turn apes into men," she told me, as if it were a matter of absolute certainty, "was a handful of modifications to the ways in which genes were switched on and off as the cells of the developing embryo became specialised. You don't need dozens of extra genes to grow a bigger brain. All you need is for a few more unspecialized cells to become brain cells. You don't need dozens of extra genes to make a clever hand or to stand upright, either. What you need is for the cells that differentiate into bone and muscle to distribute themselves in slightly different ways within the developing embryo. Becoming human isn't so very difficult, once you get the hang of it. Cows could do it. Sheep too. Lions and tigers, horses and elephants, dolphins and seals. Dogs, probably; cats, maybe; rats perhaps; birds probably not. You have to get right down to snakes and sharks before you can say that there's no chance at all. We all start out as eggs, Dr. Hitchens, and every egg that can make a pig or a donkey or a goat can probably make a human, if it only invests enough effort in shaping the brain and the hand and the backbone. That may be an unsettling thought, but it's true."

It *was* an unsettling thought. I had already thought it, and it had already unsettled me—but the fact that Alice was prepared to confront me with it, perhaps on behalf of Hemans, Rawlingford, and Bradby, but more probably on her own initiative, was even more unsettling.

I reminded myself again that it might be a lie, a careful hoax intended to persuade me, falsely, that the men from Commoner's Isle had mastered godlike powers—but if it was, it was beginning to work.

"Would you like to live as other humans do, Alice?" I asked, ostentatiously leading with my chin. "Would you like to go to school, to university, to get a job, to get married one day and have children of your own?"

"I do live as other humans do," she replied, blandly refusing to see what I was getting at. "I've been to school. I expect that I'll do all the other things when the time comes." Her tone said that she didn't expect any such thing—that she expected to be pursued and captured, shot at worst and imprisoned at best. Her tone told me that she expected to have to fight for her life, let alone her entitlements as a human being, and that she wasn't about to take any bullshit from me while she had an axe in her hands.

"I'm not sure that you'll be allowed to do anything that other teenagers routinely do, Alice," I admitted, figuring that it was best to pose as the honest man I really am. "The scientists who shaped your brain, hand and backbone were breaking the law. That's not your fault, of course, but the fact remains that you're the product of illegal genetic engineering. The law doesn't consider you to be a human being—nor do the vast majority of human beings. All the things you hope you'll be able to do depend on the willingness of human society to ad-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

mit you as a member, and that willingness simply isn't there. There's a sense, you see, in which it isn't enough just to define yourself as human—it's for human society as a whole to decide who belongs to it and who doesn't."

"No, it isn't," she replied, promptly. "White people once refused to define black people as human, and German gentiles once refused to define Jews as human, but that didn't make the black people or the Jews any less human than they were. The only people who became less human because of those refusals were the people who tried to deny humanity to others. They were the ones who were refusing to love and respect their fellow men, the ones who weren't acting morally."

She was carrying the argument better than any fourteen-year-old should have been able to, and she wasn't trying to conceal the fact. I couldn't help wondering whether that might be a mistake, if she ever got the chance to plead her case before a wider audience. Nobody loves a smartarse, especially if the smartarse is a jumped-up pig. If you want to pass for human, you can't afford to be too good at it—and, as Alice had stubbornly insisted on pointing out, real humans frequently aren't very good at it at all.

"Do you think the scientists who made you were acting morally?" I asked. "They knew what kind of a world they were bringing you into. They knew what would happen—to you as well as to them—when they were found out, and they must have known that they'd eventually be found out."

"I could understand a slave who was reluctant to bear children who would also be slaves," Alice replied, "but I can also understand those who didn't refuse. They knew that they were human, and that their children were human too, and they had to hope that the fact would one day be recognised. To have refused to bear children would have been giving in to evil, consenting to its effects."

"Why do you think the men who made you destroyed their records, Alice?" I asked. "Why do you think they were so eager to burn them that they endangered your life—not to mention mine?" Because they didn't want anyone to know the true extent of their success, I told myself. Because they wanted to be able to run this bluff.

"Because they wanted to be able to use their knowledge as a bargaining chip," Alice said. "For our benefit as well as their own. If you'd got the records, you'd have put a stop to everything. Because you didn't, we still have something up our sleeves." She seemed to think that it was a reasonably good argument—which implied that in spite of all her hard-won sophistication she really was the mere child she appeared to be.

Theoretically, I thought, an animal embryo modified to replicate human form ought to develop as neotenously as a human embryo, and an animal brain modified to accommodate all that a human brain could accommodate ought not to be educated any more rapidly. If so, Alice shouldn't be any cleverer than a fully human child reared in similarly exceptional circumstances—but without access to her school records, I knew that it would be dangerous to take too much for granted, or too little.

"No one will bargain with them, Alice," I lied. "They broke the law, and they'll be punished. Perhaps it's best if their discoveries are lost. That way, no one will be able to repeat their error."

"That's silly, Dr. Hitchens," Alice said, calmly. "If it's a mystery, that will just make more people interested in solving it. And if it's not so very difficult to solve . . . "

She left it there, as if it were some kind of threat. She was still trying to convince me, in her own subtle fashion, that my world had just ended and that another had just begun, and that if she and all her fugitive kind were slaugh-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

tered by the ARU's guns they would be martyrs to a great and unstoppable cause.

"Have you read *The Island of Dr. Moreau*, Alice?" I asked.

"Yes," she said.

"What do you think of it?"

"It's a parable. It tells us that it takes more than a little cosmetic surgery and a few memorised laws to make people—any people—human. That's true. Whether humans are born or made, the test of their humanity is their behaviour, their love and respect for their fellow humans."

"How many naturally-born humans would pass that test, do you think?" I asked.

"I have no idea," she replied. "Lots, I hope."

"Would I pass it?" I asked.

"I have to hope so," she said, casually, "don't I, Dr. Hitchens? But I don't actually know. What do you think?"

"There wasn't supposed to be any shooting," I told her. "The police were supposed to put everyone under arrest. If your makers hadn't set fire to the house and told everyone to scatter and run, no one would have been hurt. Then, the matter of your humanity could have been decided in a proper and reasonable manner." I hoped that I was telling the truth, but I had a niggling feeling that the plan to which I'd been admitted wasn't the whole one. The GE-Crime Unit *had* called up the Armed Response Unit.

"Well," said Alice, "that isn't the way things worked out, is it? It seems to me that the matter of our humanity, as you put it, has already been decided. You'll never be sure, of course, that you've got us all. Even if Ed and Kath can't get to the old icehouse, and even if they run into the police when they do, you'll never be sure how many of us got out under the noses of your surveillance unit before they figured out that the apparently obvious wasn't necessarily true."

She was definitely feeding me a line there, but I couldn't tell whether she was feeding it to me because it was false, or because it was true. I thought the time had come for me to make a grab for the axe and take control of the situation. I was probably right—or would have been, if I'd actually succeeded.

I suppose, on reflection, that I was lucky she only swiped me with the flat of the blade. If she'd hit me that hard with the edge, she could easily have fractured my skull.

When I woke up again I was in a hospital bed. My head wasn't aching any more and my eyes weren't stinging, but I felt spaced-out and bleary. It took a few minutes for me to remember where I might have been, if things had worked out differently.

I learned, in due course, that the fire brigade had found me while searching the cellars for survivors and had handed me over to the paramedics before midnight. Unfortunately, the medication they'd fed me ensured that I didn't wake up again until thirty-six hours later, so I'd missed all of the official post-mortems as well as the remainder of the action—but the urgency with which the Unit moved to debrief me reassured me that the adventure still had a long way to run.

"There were three of them," I told Inspector Headley. "I only saw one of them, and it was too dark to see her features clearly. She had blonde hair, cut to shoulder length, and very even teeth that caught what little light there was when she smiled. I couldn't swear that I'd be able to recognise her again, dead or alive. Her name was Alice. She called the others Ed and Kath. They were trying to reach an old icehouse on the edge of the lake, but the tunnel had been blocked off. Did you get them?"

"What else did they tell you?" Inspector Headley countered, jesuitically.

That wasn't a game I intended to play. "Did you get them?" I repeated.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"No," he conceded, reluctantly. "But the tunnel was still blocked off—had been for the best part of a century. Nobody got out that way."

"But you didn't pick up three stragglers in the house?"

"No," he admitted, "but if you'll pardon my pointing it out, Dr. Hitchens, I'm the one who's supposed to be debriefing you. Yes, they *could* have been piglets—and no, we wouldn't have believed that if we hadn't had the autopsy reports your colleagues carried out on the ones we shot. Personally, I'd have passed every one of the corpses as human, and I wasn't the only one who wouldn't believe otherwise until your colleagues came back to us with the results of the DNA-tests—but we didn't capture any of the piglets alive. Now, would you mind telling me exactly what happened to you?"

"Not at all," I said. "But there's one thing I need to know. Was the shooting always part of the plan? Did you always intend to kill the children?"

He seemed genuinely shocked. "Of course not." he said. "They wouldn't stop. They just kept on running. They *were* warned."

The problem was, I knew, that they'd already been warned. They'd had far too many warnings for their own good.

I recited the whole story, in as much detail as I could remember, into Headley's tape-recorder. I watched his expression becoming more troubled as I spoke, and I gathered that Special Branch were just as confused as I was as to what might be real and what might be bluff.

"This has turned into a real can of worms," he told me, when he'd switched the recorder off. "We don't know how many of the piglets might be missing. We've been waist-deep in lawyers ever since we got Hemans and his friends under lock and key, including lawyers claiming to represent your fugitive friend and her alleged litter-mates."

"How many died?" I asked.

"Only seven," he said, so weakly that it was obvious that seven was either far too many or far too few. "Three of them were real humans. Unfortunate, but it *was* their own fault. I think they wanted us to shoot, to put us in the wrong. I think Hemans told those kids to keep running no matter what because he *knew* that some of them would be killed. Cynical bastard."

I had already told him that Bradby had warned his experimental subjects that an attempt might be made to wipe them out, but I wasn't convinced that the warning had been cynical. It seemed to me that he might have been honestly concerned, and rightly so. If Alice and the others *had* got away . . .

"We might not find it easy to prove in court that the other four *weren't* real humans," I told Headley, although that news must already have been broken to him. "Did the DNA-tests throw up any evidence that they were transgenics?"

Headley shook his head. He seemed to understand the implications of the question. Transplanting human genes into animals was clearly and manifestly illegal, but if Alice had told me the truth, that wasn't what had been done to her. If Alice really was a pig through and through, genetically speaking, then there was a slim possibility that Hemans' lawyers could argue that what he and his colleagues had done wasn't illegal at all. And if Alice was as human as she seemed to be in every respect except genetically, her lawyers might have a field day trying to establish exactly what the law might and ought to mean by "human"—assuming that the Unit ever caught up with her.

Whatever had been intended, it was obvious that the raid had been a colossal cock-up. It would be up to the minister to pull everyone's irons out of the fire, and to look at the broader implications of what we now knew. Men like me were the minister's eyes and brains, so it would be up to us to figure out what the real implications of the Animal Farm fi-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

asco might be. Governments had been brought down by matters of a far more trivial nature and it was too late to hope that the situation could be contained. The cat was already out of the bag—or the pig from the poke.

Headley admitted, when I questioned him further, that without the records that had gone up in smoke, there was no way to know for sure how many experimental "piglets" there had been. They had always been kept inside, away from the prying eyes of the surveillance team, who wouldn't have recognised them for what they were if and when they'd caught glimpses of them. Their creators and the piglets themselves knew the real number, but no one would ever know whether any figure they might offer was to be trusted. Now that we knew for sure that the piglets could pass for human, at least while they were still alive and kicking, we had to consider the possibility that some of them already were passing, in Brighton or in London, or anywhere at all.

If my evidence could be taken at face value, at least three piglets had escaped. Headley told me that other debriefings had produced evidence that at least two more, both female, might have evaded their pursuers in the woods behind the manor house. He was enough of an intellectual to understand my observation that it added up to a better breeding population than God had placed in Eden or Lot had led from Sodom.

As a scientist, of course, I wasn't at all sure of that—engineered organisms hardly ever breed true, and it was perfectly possible that even if the ersatz girls could produce offspring, the offspring in question might have snouts and tails—but we had to consider the worst possible case. Bringing human-seeming babies out of a sow's womb might sound no more likely than making silk purses out of sow's ears, but we had moved into unknown territory, scientifically speaking. What did I know, given that I had never dabbled in illicit experimentation? What did any of us know, unless and until Hemans, Rawlingford, and Bradby condescended to enlighten us?

I suppose that I was lucky to be kept on the project, given that I'd ended up in hospital; but I was needed. I'd been brought in to analyse data, not to conduct interrogations, but the changed circumstances necessitated my taking a new role. My conversation with Alice had put me one up on my colleagues, so I was hustled out of the hospital with a bagful of pills as soon as the doctors could be persuaded to let me go.

"We haven't charged them yet," Headley explained to me, while I was being taken to the police station where Hemans, Rawlingford, and Bradby were to be questioned. "At the moment, they're supposed to be cooperating voluntarily with our enquiries. We're keeping in mind the possibility of charging them with arson, kidnapping and child molesting, but we want to see how they and their lawyers are going to play it before we go in hard. If they're prepared to come clean and tell us where their backed-up data is—assuming they do have backups somewhere—we might still be able to tidy up the mess."

It seemed like a reasonable assumption to me, although I wasn't sure how reasonable our mad scientists would prove to be.

I went into the interview with Hemans thinking that I was the only one on our side who'd actually thought the matter through, and the only one to have grasped the full complexity of the issue. I thought that I might be approaching the the high-point of my career—a taller peak than I had ever dreamed of scaling—if only I could keep my wits about me.

The interview was being videotaped, of course, but the tape wouldn't be admissible in court.

I couldn't measure the exact combination of emotions that mingled in He-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

mans' expression as he looked at me, but there was at least a little contempt and at least a little distaste. I couldn't understand that. When I'd first met Hemans, way back in '06, he'd been working in the public sector himself, helping to tidy up the loose ends of the Human Genome Project—but even before the HGP had delivered its treasure, its workers were being sucked into private enterprise. Comparative genomics was supposed to be the next big thing. I didn't hold it against Hemans that he had jumped ship, and I couldn't see any reason why he'd hold it against me that I hadn't.

It was obvious by '06 that the attempts that had been made to patent human gene sequences and develop diagnostic kits based on HGP sequencing data wouldn't bear much commercial fruit in the immediate future, because they'd be tied up in the courts for years. The precedents for patenting animal genes had, however, been established by the Harvard oncomouse and all the disease-models that had followed in its wake. Given that all mammals had homologues for at least ninety-five per cent of human genes, the obvious thing for ambitious biotech companies to do was to steer around the moral minefield by concentrating their immediate efforts on what could be done with animals. Pigs were already contributing organs for xenotransplantation, so they were a natural target for sequencing and potential exploitation, and there was nothing surprising in the fact that Hemans and his coworkers had decided to concentrate their efforts in that direction. What was surprising, though—and disturbing—was that they'd decided to cross the line that the European Court had drawn regarding the uses to which human genes could be put. What was even more surprising, to me—and even more disturbing—was that the way Hemans looked at me when I sat down to question him showed not the slightest trace of guilt or shame. That made me wary, and wariness made me even more punctilious than usual.

"First of all, Dr. Hemans," I said, carefully, "I've been asked to apologise on behalf of His Majesty's Government for the unfortunate deaths which occurred during the course of the police raid on Hollinghurst Manor. The police had reason to believe that a serious breach of the law had taken place, and they were proceeding in full accordance with the law, but they deeply regret the fact that so many of those fleeing the building refused to stop when challenged, forcing the Armed Response Unit to open fire."

"Never mind the bullshit, Hitchens," he countered, curling his lip disdainfully. "Are they going to charge us, and if so, what with?"

"Okay," I said, easing my tone according to plan, in order to imply—falsely, and perhaps not very convincingly—that there would be no more bullshit. "They haven't decided yet whether to charge you, or with what. There are several different schools of thought. As soon as they catch up with one of the escapers—and they will—the hawks will want to move. You have until then to make your offer, if you have one to make."

"Aren't you the one who's supposed to be making offers?" Hemans countered.

"No," I said. "I'm not. You're the one who knows whether the experiments being carried out at Hollinghurst Manor were illegal, and to what extent. You're the one who knows the identities of the children who were living in the house, and the extent of the irregularities surrounding the registration of their births, their schooling, and whatever else might come up. If you want to offer explanations and excuses before the police draw their own conclusions, you'd best do it quickly."

He didn't laugh, but he didn't seem to be intimidated either. "You must have determined the identities of the ones you killed," he said.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"On the contrary," I replied, carefully. "The police haven't been able to match the bodies with any public records or any missing persons. That is, in itself, cause for concern. There is no record of any application for the custody of any children having been made by you or any of your colleagues, so the police are completely at a loss to understand how they came to be resident in the house—or why, given that they were resident in the house, they don't appear to have attended school or to be registered with a doctor, or . . . "

"This is a waste of time," Hemans interrupted. "If you're just going to pretend that you don't know anything, I think I'll wait for the formal interrogation, when my lawyer can decide how little I ought to say."

"I spoke to one of the children in the aftermath of the fire," I told him, abruptly. "She seemed to believe that she wasn't the product of a human womb. Did you tell her that?"

"We told her the truth about her origins," he answered.

"And what was the truth?" I asked.

"That she was the product of a scientific experiment."

"An illegal experiment?"

"Certainly not. Neither I nor any of my colleagues has ever transplanted any human genes into any other animal. We have been exceedingly careful to work within the existing law."

"But you haven't published any of your work," I pointed out. "You haven't applied for any patents. Even by private sector standards, that's unusually secretive."

"We haven't published because the work wasn't complete," Hemans retorted, "and now, thanks to your murderous interference, it never will be. We haven't applied for any patents because we aren't ready. Not that it's any of your business—or anyone else's. Rawley, Brad, and I were able to finance this project ourselves."

"The police didn't set fire to the house," I pointed out. "It isn't their fault that your equipment and records were destroyed. You did that yourselves."

"No, we didn't," Hemans lied. "The fire was an accident—the result of the confusion generated by the raid."

"Your work wasn't merely self-funded," I pointed out, not wishing to pursue that particular red herring. "It was clandestine. You've made every possible effort to keep it secret. You seem to have been using children as experimental subjects—children of whom there is no official record of any kind. Even if they were your own children, that would be illegal. If they aren't . . . there's a great deal that requires explanation."

"And you already know what the explanation is, so we'd make better progress if you cut to the chase."

"I'm sorry," I said, "but I don't know any such thing. I don't know that the story the girl gave me was anything but a pack of lies, cooked up to make your work seem much more successful than it was. We can't interrogate the dead, so we have no way to know whether the individuals identified by genetic fingerprinting as pigs in human form were capable of speech, let alone rational thought. I'm certain in my own mind that the scene in the cellar was staged—how else would the three of them have been able to disappear, given that the exit they were ostensibly aiming for was blocked?"

"Maybe they found another," Hemans said. "Who did you talk to?"

"She called herself Alice."

"We all called her Alice," he assured me. "She's not among the dead, then? And she did get away from the gunmen?"

"They *will* find her," I told him. "Whoever and whatever she is, she can't hide. Wherever she went, there'll be a trail. This is the twenty-first century. *Nobody* can hide for long."

"That includes the people chasing her," he pointed out. "It's one thing to surround a house in the middle of a

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

wood for one night only, and quite another to conduct a nationwide manhunt for weeks on end. How many are you looking for?"

"How many were there?"

He still didn't smile, but he knew that that was one of the best cards he held up his sleeve. If we'd been fooled into thinking there were at least seven, when there were really only four, we might keep searching for a long time—and he was right about the difficulty of hiding a nationwide manhunt, whether that was the right word for it or not.

"Why did you do it?" I asked him, abruptly. "It's such a strange thing to attempt. Why did you even *try?*"

"You're a geneticist yourself, Dr. Hitchens," he replied. "You, of all people, should understand."

I thought I did. I thought that now was the time to show him that I did. "If you really did do it," I said, "I can only conclude that it was by accident. I can't imagine that you had the least idea when you started out just how successful your experiment in Applied Homeotics would be. I can only suppose that you started out trying to figure out what the limits of embryonic plasticity were, and that you wouldn't have dared to superimpose a human anatomical template on the pig embryos if you had realised that it would work so spectacularly. Once you found out what the babies were actually capable of, you must have been thrown into a quandary, unable to decide what to do next—so you simply carried on, monitoring their development in secret, not knowing when or how to stop. You must have been grateful when the police finally made their move, taking the matter out of your hands."

He looked at me with what seemed to me to be a new respect. "You keep saying *if*," he pointed out, "but you don't really believe there's an if, do you? You know perfectly well that Alice is the real thing."

"I don't *know* it," I told him, truthfully. "You're the one that *knows*. How clever is she, do you think?"

"Not so very clever," he told me, feigning slight reluctance. "Precocious, but not so very far from the norm. Only human. But her parents *were* pigs, Dr. Hitchens. We did do it—and we're prepared to defend ourselves in any court you care to haul us into. We're prepared to defend it all the way. I like your label, by the way. *Applied Homeotics* sounds so much more dignified than Brad's *homeoboxing*. If you know that that's what it is, you must also know that it isn't going to go away. Not now."

Hemans didn't just mean that he and his colleagues were prepared to defend the legality of their experiment and the merits of their new biotechnology. He meant that they were prepared to defend the humanity of its first products. Maybe he *was* just a little bit grateful to have his hand forced, but he had decided long ago exactly how he would play it when the forcing started. He might have fallen into a godlike role by accident, but he had accepted the responsibility that went with it. Our side hadn't, yet. Our side had gone in blind and trigger-happy. That wasn't my fault, but I'd have to carry the can along with everyone else if things continued to get more and more screwed-up.

"I also know that it can't be *merely* a matter of tweaking development times," I said. "Pigs may have homologues of ninety-eight point six per cent of human genes, but that still isn't enough. Whatever you told Alice, you had to make up a substantial fraction of the remainder. Maybe you copied the sequences from a contig library, used YACs to multiply them and then delivered them into the embryo by retrovirus, but that doesn't make it legal. Human sequences are human sequences, even if you build them base by base, and when you transplanted them into pig embryos you broke the law."

"We didn't transplant anything," Hemans insisted. "We didn't break any

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

laws. Put us in the dock and we'll prove it. But you don't want to do that, do you?"

"That depends," I hedged—but his lip curled again, and I knew that I had to play the game more openly than that. "You have to give me more," I went on. "You have to give me some idea of what you actually did, if you didn't transplant the human sequences."

"Why should I?" he countered, bluntly.

I wasn't speaking for myself, but I had to make the offer. "Because we might still be able to put this thing away," I told him. "We might not be able to unmake the discovery, but we might be able to save ourselves from its consequences, at least for a while."

"No," he said, wearily as well as firmly. "We can't. We thought about it—Rawley, Brad and I—but we decided that we couldn't. We're not policemen, Dr. Hitchens, we're not politicians and we're not lawyers. We couldn't put it away, and we still can't. Not because it wouldn't do any good, although it wouldn't, but because it simply wouldn't be right. We're not going to cooperate, Dr. Hitchens. We're going to take it to the bitter end. They're human, and every ovum produced by every animal on our farms and in our zoos is potentially human. That's the way it is, and we can't just ignore the fact. We can't make any deal that doesn't make the whole matter public."

"You were the ones who never published," I pointed out. "You were the ones who kept on working in secret."

"It *wasn't finished*," he told me. I was sure that he wasn't trying to wriggle out of it.

"If you're telling the truth," I told him, "it never will be. But you still have to convince me of that."

He was still looking at me with faint disgust, because of what he thought I'd become, but in the end he had to loosen up. Like me, he didn't have any alternative.

Even when we'd reviewed the tape and gone through it step by step, the senior Special Branch men and most of the Home Office staff still didn't get it.

"Okay," said the Unit's top man, "so the one you talked to was smart and kind of cute—but she isn't ever going to get to court, let alone to daytime TV. She's a pig. An animal. We *can* send her to the slaughterhouse. We can get rid of them all, if we decide that's the appropriate thing to do."

"We wouldn't necessarily have to go that far," one of the junior ministers put in. "Once people know what she really is, that will colour everyone's view of her. It doesn't matter how cute or clever she is, nobody is going to make out a serious case for making any more like her. Let's not throw the baby out with the bathwater here."

What he meant, of course, was "let's not throw the bathwater out with the baby." He figured that there might be useful purposes to which the technics might be put—secret purposes, of course, if the legal advisors decided that the whole area was legally out of bounds, but government-approvable purposes nevertheless. He was thinking about designing ultra-smart animals for use as spies and soldiers. He'd probably been a fan of the wrong kind of comic books in his youth. He wasn't thinking Boy's Own adventures; he was thinking *Reality is What You Can Get Away With*.

The permanent under-secretary knew better, of course. "She was right about the records," he observed, reflectively. "The fact that we failed to recover them makes it a mystery. As soon as the rumour spreads that you can turn animal embryos into passable human beings with standard equipment and a chicken-feed budget, everybody and his cousin will be curious to know how it's done. We left it far too late to make our move—and I'm talking years, not weeks. We should have applied the new

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

laws as soon as we had reason to believe that they'd been broken."

"Without the records," I said, quietly, "there's no way to be sure that even the new laws *have* been broken. And that makes it an even better mystery."

"She's a *pig*, Hitchens," the plain-speaking policeman pointed out. "She's a pig that looks like a little girl. If that isn't illegal genetic engineering, what is?"

"If Hemans is telling the truth," I said, "Applied Homeotics isn't genetic engineering in the legal sense at all. He had to make up most of the missing one point four per cent somehow, but if he'd simply tried to transplant or import it he'd probably have failed in exactly the same way that most other attempts to transplant whole blocks of genes have failed. Assuming that what he told me was true—and I'm inclined to believe him—his way is *much* better, and it's not against the law. If this ever gets to court, we might have to hope that the backup records really have been destroyed—because if they haven't, and Hemans, Rawlingford, and Bradby can use them to mount a successful defence, we're going to look really stupid."

"That won't happen," the permanent under-secretary said. "If they want any kind of life after acquittal, they'll make a deal. They'll give us their secrets *and* they'll sign a nondisclosure agreement. The real question is whether other people will be able to duplicate their work anyhow, guided by the knowledge—or even the rumour—that it's *possible*."

"Who but the wackos would want to?" asked the chief inspector. "Do you really think the world is full of people who want to turn out imitation human beings? Even the worst kinds of animal liberation lunatics aren't about to start clamouring for every piglet's right to walk on two legs and wear a dress. This is the real world. Some animals are a hell of a lot more equal than others, and we're them, and that's the way it's going to stay."

It was time to cut through the bullshit to the real heart of the matter. "You're not taking Alice seriously enough," I told them. "You haven't listened properly to what she and Hemans said. Suppose she's right. Suppose she isn't a pig pretending to be a human. Suppose she really is a human."

"She's not," the policeman said, flatly. "Genetically, she's a pig. End of story."

"According to her," I pointed out, "genetics doesn't enter into it. Human is as human does—and her brothers and sisters were the ones who got gunned down because they didn't believe that their fellow men would open fire on a bunch of unarmed children. Without her school records, and until she consents to be tested again, we can only guess at her IQ, but on the evidence of my conversation and Hemans' assurances I'd be willing to bet that it's a little bit higher than the average teenager's. You haven't yet begun to consider the implications of that fact."

"*If* pigs in human form are smarter than real humans, that's all the more reason for making sure that all the world's pigs stay in their sties," the man from Special Branch insisted. The minister was content to listen, for the time being.

"If Hemans is telling the truth," I went on, disregarding the policeman's interruption, "he and his colleagues didn't need to transplant any genes to make her human. DNA analysis of the dead bodies supports that contention. The difference between a human being and a chimpanzee, as Alice pointed out, is very small. The most important differences are in the homeotic genes—the genes that control the expression of other genes, thus determining which cells in a developing embryo are going to specialise as liver cells or as neurons, and how the structures built out of specialised cells are going to be laid out within an anatomical frame. If you have an alternative control mechanism which can take over the work of those controlling genes, they become redundant—

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

and as long as the embryo you're working with has the stocks of genes required to make all the specialized kinds of cell you need, you can make any kind of an embryo grow into any form you required. You could make human beings out of pigs and cows, tigers and elephants, exactly as Alice said—and *vice versa*."

"That's bullshit," the policeman said. "You've said all along that they had to make up the difference. We have to have the extra genes that make us human."

"That's true," I agreed, wondering how simple I could make it, and how simple I'd need to make it before he could understand. "And until today I'd assumed, just as you had, that the extra genes would have to be transplanted, or that they'd have to synthesized from library DNA and imported—but that almost never works with whole sets of genes, because mere possession of a gene is only part of the story. You have to control its expression—and that's what Applied Homeotics is all about. We've become so accustomed to genetic engineering by transplantation that we've lost sight of other approaches—but Hemans and his friends are lateral thinkers. We didn't get to be human by having genes transplanted into us—we *grew* the new genes *in situ*. Only a few million of the three billion base pairs in the human genome are actually expressed, but it's an insult to the rest to call it junk DNA, the way we used to. Most of it is satellite repeat sequences, but in between the satellites there are hundreds of thousands of truncated genes and pseudogenes, all of them in a constant state of crossgenerational flux because of transposon activity.

"Pigs may only have homologues of ninety-eight point six per cent of our genes, but they also have homologues of almost all the protogenes making up the difference. Those protogenes are not only present within the pig genome, they're mostly in the right sites. Hemans, Rawlingford, and Bradby didn't need to transplant any human DNA—all they had to do was tweak the pig DNA that was already in place. And as Alice said when she had me trapped in Wonderland, if you can do it to a pig, you can do it to a cow—and given that the common ancestor relating us to rats and bats seems to be more recent than the one relating us to pigs, you can probably do it to a hundred or a thousand other species."

"It still sounds like bullshit to me," the policeman repeated, as if he were some obstinate DNA satellite hopelessly intent on taking over an entire genome.

"You may not like its implications, Chief Inspector," I said, tiredly, "but that's not enough to make it bullshit. I don't know *exactly* how Hemans did it, because he isn't going to tell us until he gets some guarantees, but I already know how I'd go about trying to copy the trick, now that I know that it can be done. Transforming and activating the protogenes is probably the easy part, given that every sequencer in the world is avid to learn how to write as well as read the language of the bases. I'm pretty sure I could figure out a way to do that. If I could also figure out a way to delay an embryo's phylotypic stage—that's the moment at which the control of an embryo's development is transferred from the maternal environment to the embryo's own genes—I might be able to stop the homeotic genes kicking in at all. Given that the onset of the phylotypic stage is much later in some species than others, that doesn't seem be any great hurdle to leap. A careful inspection of the research Hemans, Rawlingford, and Bradby published before they got together at Hollinghurst Manor suggests that they were probably using human maternal tissue as a mediator in the embryonic induction process. That's not genetic engineering, of course—there's no law against interspecific transplantation of mature tissues or the use of human somatic cells in tissue cul-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

tures. Believe me, sir: Applied Homeotics is a whole new field of biotechnology. None of the existing rules apply."

"So you're telling me that every fucking farm animal in the realm—not to mention every household pet—is potentially human?" The Special Branch man was looking at me with as much contempt and distaste as Hemans had, but with even less justification.

"No," I said, patiently. "I'm telling you that the embryos they produce as parents are now potentially human. It still adds a whole new dimension to the ethics of animal usage, but we don't yet know how far that dimension extends. We can be reasonably sure that birds and reptiles don't have the required stocks of protein-template genes, and some of the smaller mammals probably don't have them either, but the question of where the limits of potential metamorphosis actually lie is a minor one. The point is that unless we're the victims of a monstrous hoax, humanity is determined almost entirely by the development of the embryo. If so, Hemans is right. Alice and all her kind are as human as you or I. An even more important question, of course, is what this kind of technology might allow us to make of human beings."

I paused for effect, but nobody jumped in with an exclamation of astonishment. They were all waiting, guardedly, to see what came next.

"We, after all, are merely *nature's* humans," I told them. "We're a product of the rough-and-ready process of natural selection, and control of the expression of *our* genes has been left to other genes. Homeotic genes were never an ideal solution to the problem of embryoformation—they were just the best improvisation that DNA could come up with on its own. Alice's humanity is the product of relatively unskilled artifice—and the evidence we've so far seen suggests that relatively unskilled artifice might already be the slightly better maker of men. If it isn't, then it certainly will be, just as soon as we bring our ingenuity fully to bear on the problem.

"The genie's out of the bottle, gentlemen. We can pass all the laws we like against the genetic engineering of human beings, and we can make sure if we care to that what Hemans, Rawlingford, and Bradby have actually done to pig embryos will in future fall within the scope of those laws—but that won't alter the fact that human beings and the world they have made are imperfect in more ways than any of us would care to count, and that Hemans, Rawlingford, and Bradby have found a new way to allow us to set to work on those imperfections. If Alice is telling the truth, we've already passed through the looking-glass, and there's no way back. You might be able to stop the animals walking and talking, but you won't be able to stop the people. If a mere pig can be a better human than any of us, *imagine what our own children might become, with the proper assistance!*"

The minister and his junior nodded gravely, but that was just the legacy of good schooling by their image-consultants. The chief inspector looked dumbfounded. The permanent under-secretary was the only one who was keeping up, after his own crude fashion. "You're talking about building a Master Race," he said reflexively. If in doubt, hoist a scarecrow.

"I'm talking about D-I-Y supermen," I told him, frankly. "I'm talking about something that can be done with standard equipment on a chicken-feed budget, after a little bit of practice on the family pet. I'm talking anarchy, not mad dictators. If you intend to make a deal with the Three Musketeers, you need to know what cards they're holding. It's still conceivable that they're bluffing, and that Alice was just feeding us a line, but I can't believe that—and if they're *not* bluffing, the old world has already ended. The GE-Crime Unit will catch up with the runaways eventually, but it's al-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ready too late. Their story has been told, and *will* be told, again and again and again."

Nobody told me I was crazy. The policeman might have lacked imagination, but he wasn't stupid enough to continue to argue that his reflexive prejudices were worth more than my educated judgment. "We could still shoot the lot," he muttered—but he knew, deep down, that it wouldn't do the trick, even if that option could be put back on the agenda.

"What *can* we do?" asked the permanent under-secretary, who had already moved reluctantly on to the next stage.

I knew that it wouldn't be easy to persuade him, but nobody ever said that working for the Home Office was going to be easy. The instinct of government is to govern, to take control, to keep as tight a hold on the reins as humanly possible.

"Basically," I said, "we have two options. We can be Napoleon, or we can be Snowball. Neither way will be easy—in fact, I suspect that all hell has already been let loose—so I figure that we might as well try to do the right thing. For once in our lives, let's not even try to stand in the way of progress. I know you're not going to be grateful for the advice, but my vote is that we simply let them all go and let them get on with it."

"Let public opinion take care of them, you mean," the junior minister said, still trying his damnedest to misunderstand. "Let the mob take care of them, the way they take care of child molesters."

"No," I said. "I mean, let artifice take its course. Let the pioneers of Applied Homeotics do what they have to, and what they can. Even the pigs."

It *wasn't* easy to persuade them, but Hemans and his collaborators had a battery of lawyers on their side as well as reason and stubbornness, and in the end, the situation simply wasn't governable, even by the government. Eventually, I made them see that.

They weren't grateful, of course, but I never expected them to be. Sometimes, you just have to settle for being right.

By the time I saw Alice again she was twenty-two and famous, although she never went anywhere without her bodyguards. She came to my lab to see what I was working on, and to thank me for the small part I had played in winning her precarious freedom.

"You did save my life," I pointed out, when we'd done the tour and had time to reflect.

"That was Ed and Kath," she admitted. "They were the ones who picked you up and dragged you down the stairs. All I did was hit you with the axe when you tried to grab it."

"But you hit me with the flat bit, not the edge," I said. "If you'd hit me with the edge, I'd be dead—and so, I suspect, would you."

"They really wanted to kill us all," she said, as if it were still very hard for her to comprehend.

"Only some of them—and only because they didn't understand," I told her, hoping that it was the truth. "None of us understood, not even Hemans, Rawlingford, and Bradby, although they'd had longer to think about it than anybody else. None of us really understood what it meant to be human, because we'd never had to explore the limits of the argument before—and none of us understood what scope there was for us to be more than human. We simply didn't realise how easy it is to be creative, once you have the basic stock of protein-producing genes—and protogenes—to work with. Maybe we should have, given what we knew about the diversity of Earthly species and the unreliability of mutation as a means of change, but we didn't. We needed a lesson to bring it home to us. How does it feel to be accepted as human just as the species is becoming obsolete?"

"My children will have the same chances as anyone else's," she pointed out. I wasn't so sure about that. She was now as human as anyone else, in law as

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

well as in fact, but there were an awful lot of people who hadn't yet conceded the point. *My* children, on the other hand, really would have opportunities of which I had never dreamed ten years before; the people who wanted to reserve the privileges of creativity to imaginary gods wouldn't be able to stop me making sure of that.

"I was sorry to hear about Hemans," I said. Hemans had been taken out by a sniper eight months before. I had no reason to think that he and Alice were particularly close, but it seemed only polite to offer my condolences.

"Me too," she said. "It always upsets me to hear about my friends being shot."

"What happened at the manor really wasn't a conspiracy," I told her, although I'd never been *entirely* sure. "It was a genuine mistake. It's in the nature of Armed Response Units that they sometimes make mistakes, especially when they're working in the dark."

"I remember Dr. Hemans saying the same thing, afterwards," she admitted. "But some mistakes work out better than others, don't they?" She wasn't talking about the wayward ways of mutation. She was talking about the freak of chance that made me go on when I should have turned back, and the one that had made Ed and Kath pause to pull me out of the fume-filled corridor and down the cellar steps to safety. She was talking about the freak of chance that had made me go on when things got tough at the Home Office, blowing my career in government in order to make sure that nobody could put a lid on it even for a little while, and that the government couldn't even make a convincing show of governing the unfolding situation. She was talking about the mistake that Hemans and his colleagues had made when they decided to try something wildly ambitious, and found that it succeeded far too well. She was talking about the fact that science proceeds by trial and error, and that the errors sometimes turn out to be far more important than the intentions.

"Yes they do," I agreed. "If that weren't the case, progress wouldn't be possible at all. But it is. In spite of the fact that every significant advance in biotechnology is seen by the vast majority of horrified onlookers as a hideous perversion, we do make progress. We keep on passing through the looking glass, finding new worlds and new selves."

"You've been practising," she said. "Do you really think you can talk yourself back into the corridors of power?"

"Not a snowball's chance in hell," I admitted. "But I did my bit for the revolution when I had the chance—and there aren't many of nature's humans who can say that, are there?"

"There never used to be," Alice admitted. "But things are different now. Human history is only just beginning."■

READERS: If you are having problems finding *Analog Science Fiction and Fact* at your favorite retailer, we want to help. First let the store manager know that you want the store to carry *Analog*. Then send us a letter or postcard telling us the full name and address of the store (with street name and number, if possible). Write to us at: Analog Science Fiction and Fact, Dept. NS, 6 Prowitt St., Norwalk, CT 06855-1220. Thank you!

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

2001: MY FINAL MILESTONE

Like most science fiction loving kids, I spent a lot of time wondering about the future. The far future—that is, years that I was unlikely to live long enough to see—I could let take care of itself. But then there were all those years lying ahead for a twelve-year-old which, barring major calamity, I was pretty certain to experience. As I look back now from 2000, I recall certain years that stand out as milestones. Some of those years I had also looked *forward* to as milestones. The rest were unanticipated.

In my previous column ("Voodoo Doodoo," Oct. '00), I took to task Dr. Park and his book *Voodoo Science* for his "anti-space" bias. But this time I'm going to discuss, among other things, a very optimistic book on exploring the Moon, that being *Where the Winds Sleep* by Neil P. Ruzic, since it is composed of milestones that might have been.

For reasons entirely unclear to me now, when I was twelve (most of 1972) I used to think of 1977 as being "the beginning of the future." 1977 was the year I would graduate from high school, but I'm pretty sure that event wasn't what made me think of '77 as The Future. When '77 arrived, I did graduate, but I worked at my high school during the summer. Thus, I was able to watch a drop test of the Space shuttle *Enterprise* on TV with Mr. Vanette, my high school physics teacher. Seeing the form of the shuttle's lifting body glide smoothly to the ground (how novel it was to us then!), I really felt that the future was upon me. My first milestone of the future had been reached.

Of course, for lots of other people, '77 was the year Elvis died, a sad and unanticipated milestone. And *Star Wars* debuted that summer, too, destined to remake Hollywood in its own image.

The next milestone I waited to reach was the same one everyone waited for, that being 1984. Would the world really devolve into an Orwellian Hell? I suppose in some ways it did, but in most ways it didn't. In all honesty, the thing I remember most about 1984 was that my team, the Detroit Tigers, finally went on to win the World Series. As it turned out, the year in the decade of the 80s that most of us SF types would recall is 1986, and the *Challenger* explosion.

Quite the hideous "milestone" that turned out to be. I recall watching that launch at home on TV with my father, which was unusual since I seldom watched anything on TV with my dad—certainly not a morning space launch. But there we were, and there was the shuttle, climbing, climbing, and bang. The voice of mission control continued as if nothing was amiss for a few seconds. Then somewhere in there he said "Obviously a major malfunction." Ah, yes, my generation's equivalent of the JFK assassination—I find myself getting choked up as I write this.

But that moment did solidify a feeling that had been growing in my mind up to that point, and from then on, I totally de-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

coupled whatever it was that NASA was doing with "our future in space." (I now pay little attention to what's happening with the shuttle program. Sure, I know *Atlantis* is paying a visit to the fraction of the space station that's in orbit—some kind of a repair mission—even as I write. But details of what it is that needs fixing and how it got broken in the first place elude me.)

A few months ago I finally tracked down (via *www.abebooks.com*—try it!) a book I'd enjoyed reading when I was a kid, the aforementioned *Where the Winds Sleep*. The subtitle describes what the book is all about: *Man's Future on the Moon: A Projected History*. Ruzic wrote the book as if looking back from 2045. The copyright date is 1970. Ruzic had projected that by 1975 "a few scores of men" would have left tracks on the surface of the Moon. Of course, his projected history didn't make it to the first five-year milestone—by '75, *Apollo* was over except for a meaningless "handshake in space." By the time of the *Challenger* disaster, it was pretty clear that NASA wasn't going to return to the Moon anytime soon. Ruzic had projected that by 1985, we'd be doing "science without air" on the Moon, taking advantage of the vast reservoir of vacuum that our sister planet holds. And by 1990, large astronomical observatories were to be in place, as free from atmospheric distortion as the Space Telescope, yet stabilized by the mass of the Moon.

My next milestone year was totally unanticipated, that being 1989. My father died that year. My world had already become destabilized by then, and it came crashing down. Cold Fusion was announced and then disannounced, but the Cold War ended and stayed that way. That was, until recently, the most eventful year of my life. (It's now in a tie with this year, but I'm getting ahead of myself.)

Although my twelve-year-old self had projected none of it, the 90s turned out to be a decade full of personal milestones. I got married, I had children, and I sold my first science fiction story. I no longer had to think about dating, but about diapers instead. *Analog* authors ceased to be just names, and in many instances became friends. (For those of you who wonder about such things, yes, it is really, really cool to be able to go sailing with Bud Sparhawk, or to be able to call up the president of SFWA (Paul Levinson) and ask for a blurb for your novel.) Still, to my younger self, the 90s would have been a disappointment. At twelve, I didn't want to get married, and I had barely thought of writing science fiction. I wanted to go to the Moon, and even more than that, to see Saturn and her rings. I wanted the future that I read about in Heinlein and Asimov and Clarke, and during the 90s, Humanity was *supposed* to have been getting pretty far flung. In 1972, no one had heard of the Internet, Watergate hadn't happened yet for Whitewater to be compared with it, and I didn't have cable TV, let alone any idea that alien cultures would be found thriving today on a channel called MTV.

And so I find myself in the year 2000. I consider this to be my last column of the 20th century. I have known since I was a kid that 2001 is the real start of the third millennium, and 2001 marks the final anticipated milestone from my youth.

2000 didn't quite work out as I'd hoped. At the moment I am without a job. (Those of you familiar with *Monty Python and the Holy Grail* and the reasons for why the Knights of the Round Table decided *not* to go to Camelot will understand why I'm no longer with my previous employer.) All my belongings are in boxes since I'm moving my family back to Michigan. Ruzic's illustration for the chapter on the year 2000 stands in stark contrast to my present reality. It shows an electromagnetically levitated car racing across the Lunar surface on a superconducting highway. You can see

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

a family inside the car, perhaps playing a game or getting ready for lunch, as the car automatically delivers them to where they want to go. Sigh. What could have been, what *should* have been. Why am I not in that car? Why aren't any of you?

By 2015, Ruzic had inhabitants of the Moon living comfortably in underground cites. I found it very interesting to read the book again and note how Ruzic's vision had influenced my own science fiction, since my own Luna City is much like his. By 2025, men and women were to be flying like birds in huge air-filled domes, just like Heinlein described it in "The Menace from Earth." Ruzic's illustration for 2030 shows a man on a bicycle. He's pedaling down a road next to acres of corn so tall they'd shame Iowa. The rider is carrying a large potted tree on the back of his bike, destined for transplanting somewhere. You can see the curve of the dome in the distance, and stars shining through it.

By 2035, we were to be on our way to the stars. Ruzic talks about the first mission to Alpha Centauri as well as the continuing conquest of our own Solar System. The illustration for that chapter shows a large spaceship flying past the rings of Saturn. *Sigh*.

Reading Ruzic can't help but make one muse about what might have been, and ask oneself what went wrong. As I consider this past year of my personal life, I can't help but do the same thing. It was a year full of irony and missed opportunities. Yet that having been said, it was a year wherein I *lived* a science fictional life, meeting people and learning things that even my twelve-year-old self would have been blown away by. On top of that, my first novel, *Dykstra's War* is scheduled for December release from Baen Books. (Therein, a lot of action takes place under the Lunar surface.) That is another fine milestone to anticipate.

There's also no reason to think that some of the milestones Ruzic anticipated can't still be reached. Since NASA didn't take us back to the Moon, others have been busy trying to find other means to get there. *Artemis* magazine (edited by *Analog* staff alumnus and frequent contributor Ian Randal Strock), for instance, is devoted to the idea of humanity having a prosperous future on the Moon. And technology has developed in ways that Ruzic could not anticipate. Those levitating cars of Ruzic's 2000 could today fly down Lunar freeways fabricated from high temperature superconductors.

Although one of the reasons I bought *Where the Winds Sleep* was to relive some happy memories, I also bought it because it is *still* a valuable book. The focus of the book is not the timeline, but the reasons why we would want to settle and develop the Moon. That the sort of exploration of the Moon that Ruzic projected for 1975 didn't happen by then doesn't mean that such exploration couldn't happen by 2005. We can slide the timeline forward by thirty years. I'm willing to wait until 2030 to ride those superconducting highways—I'll only be seventy by then.

I will still be disappointed next year when there is no *Discovery* on her way to Jupiter. I still think of that movie as an experience, and now find *Star Wars* to be mere entertainment, though in '77 I was as overwhelmed as anyone. Although we're a long ways away from the technology (inconsistent as it was) of *Star Wars*, that of *2001: A Space Odyssey* is well within reach. Just as we could slide the timeline forward and still have the Moon of *Where the Winds Sleep*, we could do the same for Kubrick and Clarke's masterpiece.

Anyone for *2001: A New Hope*? ■

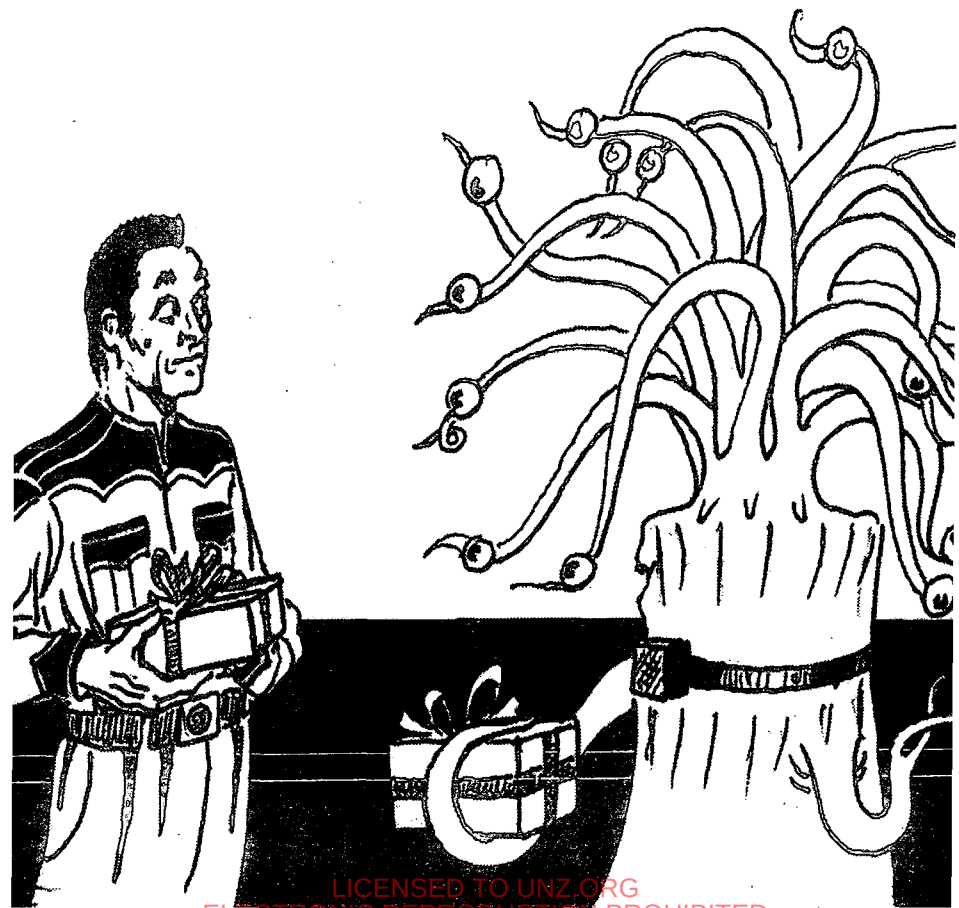
LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

It's the Thought That Counts

Jerry Oltion

Any good custom should be adaptable!

Illustration by Kelly Freas



LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"So what's in it for us?" asked the alien.

It stood near the side of the rectangular mess table in the galley of the exploration ship *Commerce*, while Captain Blackmore and his crewmate, Foreign Market Coordinator Nalaway, sat at either end. The alien, named Bshek, stood because it apparently could do nothing else; its body was a squat cylinder atop a brushlike bundle of millipede legs. In their week and a half on the planet, the interstellar merchants had never seen a Stalkie sitting down. The aliens' only flexible appendages seemed to be the single tentacle which emerged from the tops of their bodies, tapering upward to end in a dozen smaller tentacles, each with an eye set an inch or so from the end. As Captain Blackmore had said when he first saw them: they looked good at toolmaking, lousy at dancing.

Fortunately he and Nalaway had come here to exchange technology, not culture. Except for one element of it, of course. The one about which the alien had asked, "What's in it for us?"

"Goodies," replied the captain. "Good food, good friends, and most of all, good presents."

"Hmm," the alien said. Its mouth was a tiny hole just below the base of its tentacle, but it had a surprisingly strong voice. Most of that rigid torso must have been lungs. "Presents. That was not translated. Define please." It tapped the little box it wore strapped around its barrel chest, the one Blackmore and Nalaway had given it so they could speak with it—and incidentally eavesdrop on everything it said to its companions when it thought the humans weren't listening.

Blackmore nodded to Nalaway, who put down the datapad on which she was studying the language as the translator mapped it out for her, and said. "A present is something you give to someone without asking for anything in return."

"That is not possible," said the alien. It wiggled its tentacle in a sinuous wave, then looped it into a circle overhead. "No sane creature would give something away without expecting compensation."

"Of course not," said Blackmore, who agreed wholeheartedly. "But on Christmas we loosen the rules a bit. Instead of establishing up front what everything is worth, we give each other something without knowing what the other side is going to give in return. That puts a little mystery into it."

"Why is this good?"

"Heh, heh, heh. Mystery is the spice of life. It's fun to imagine what sorts of things you might get. And of course it's fun to figure out what you can give someone, too. Ideally it should be something they can use, but wouldn't have bought for themselves."

The alien whistled softly, the sound that Nalaway had tentatively tagged as a laugh. "That is unlikely to be a problem," it said, "considering we have not yet begun trade relations."

"True enough," said Blackmore. He grinned. The nature of those relations would be determined in part by who came out ahead in the gift exchange, but the alien didn't have to know that yet.

Nalaway spoke up again. "It's not the gift, but the thought that counts. It symbolizes trust and good will."

Blackmore shot her a warning look, but she only smiled at him.

The alien said, "I see. Very well, then. I will bring a present to your party. What else must I bring?"

"Something to eat, since most of our food is probably unpalatable for you. And a couple of friends or family members to help enjoy it."

The alien raised its tentacle straight up, but forgot about the low ceiling in the spaceship and banged its eyes against the light panels. "Ow! Er . . . friends? Is that required as well?"

"Well, it's not required, but it wouldn't be much of a party with just the three of us. The more the merrier, when it comes to Christmas."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"I see. Must the friends bring presents, too?"

"That would be the polite thing to do, yes. We'll have presents for them."

"Peculiar," the alien said. "Er, I mean, an interesting custom. Yes, very interesting. I will make friends with Fnork and Knara, then. When should we arrive?"

"How about sundown tomorrow?" Blackmore said. The Stalkies' planet had a twenty-nine hour day, but he and Nalaway hadn't been there long enough to drift very far out of synch; sundown would be about midnight on Christmas Eve, ship's time.

"Sundown it is," said the alien. It backed away, gliding smoothly on its millions of little legs, rotating around so it faced the door while it continued to move in a straight line.

When it was gone, Blackmore rubbed his hands together and said, "Prezzies!"

"You're disgusting, you know that?" Nalaway said.

He looked sideways at her. "How so?"

"Using Christmas to get free technology from these people."

"They're not people," Blackmore reminded her. "They're aliens humanity has never even heard of before. The more we can get from them for free, the better our bargaining position will be for the rest of it."

"You didn't even tell them what Christmas was really about."

"Sure I did. Goodies." He rubbed his hands again, then reached for her notepad. "Now all we have to do is find out what they plan to give us, and find some useless trinket that looks like it's worth the same to give them in return."

He set the datapad to record and transcribe everything Bshek said, then dropped into his bunk for a quick nap. That was the only way to deal with long planetary days; catnap every few hours.

When he woke he skimmed over the transcription. There was a lot of stuff like "Greetings, [untranslatable] underling," and "Oh, yes, a little more [untranslatable] would be [untranslatable]," but Blackmore quickly scanned until he found what he was looking for. On the screen he read:

Bshek: "The aliens have invited me and two of my breeding partners to a religious ritual aboard their starship. We are to bring food and presents."

2nd Stalkie, Knara: "Breeding partners? Why breeding partners?"

Bshek: "I do not know. That is what they asked of me."

Knara: [untranslatable growl] "That is perverse."

Bshek: "They are aliens. We must not judge them by our standards. Besides, if we are to trade successfully with them, we must—"

3rd Stalkie, Fnork: "What are presents?"

Blackmore skimmed through Bshek's explanation, though he noted that it took several pages of transcript to do so. He began reading again when Fnork, asked, "So what should we give them?"

Bshek: "It apparently must be something of value. And we must apparently rely only upon their good intentions to return something of approximately equal value."

Fnork: "That is even more perverse than requiring us to breed before we attend."

Blackmore laughed. The translator had obviously messed up his remark about "bring a couple of friends or family members." He would have cleared up the misunderstanding if there was any way to do it without letting Bshek know he was being bugged, but he couldn't see how. Oh well, let the aliens have a good time at his expense; he didn't care.

They didn't seem to be in any great hurry to do it. Blackmore read page after page of transcription as they tried to decide what presents to bring, most of them unfortunately tagged [untranslatable], but the few that came through made him nearly leap for joy.

"Perhaps gemstones," Fnork suggested at one point.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Bshek: "No, they must have gemstones on their world. It must be something they cannot obtain for themselves."

Fnork: "How about a new data storage device for their starship? From what you've described to me, the ones they have are rather inflexible."

Bshek: "No, we mustn't offend them by implying that theirs are insufficient."

"Oh, offend us, please," Blackmore muttered when he read that, but on the very next line Knara suggested something even better.

Knara: "How about a self-replicating robot to help repair meteor damage in flight?"

"Yes, yes!" Blackmore thought. To heck with meteor damage—the ship was shielded ten ways till Tuesday—but a self-replicating *anything* was practically a license to print money.

The aliens agreed that that was a possibility, but they continued to brainstorm.

And suddenly Blackmore realized he had better do the same. The aliens were talking real gifts here; he'd better upgrade his own offerings or he'd look like a piker. That wouldn't be good for future negotiations. The idea here was to make them think they'd come out ahead, and to make them think Blackmore didn't know the value of his own goods. That would be hard to do with a matching pen and pencil set or a blender.

He scanned on through the transcript, trying to find out what they had decided upon, but they apparently hadn't figured it out yet. Hmm. What could he give them? Gemstones were out, and so was a datapad. And as he read on through the aliens' conversation, he realized that practically everything in the cargo hold was either too primitive or completely useless to them.

What could he give them? There had to be something.

* * *

Nalaway had decorated the lounge with strings of cargo straps and blinking navigation lights. She had even wired together some green strips of packing material to make a tree. Christmas music played softly on the sound system, and the aroma of roast turkey and dressing permeated the air.

Blackmore hoped the aliens' food didn't smell horrible.

He didn't have time to worry about it; they arrived at the airlock door just as their orange sun touched the horizon.

"Come in, come in!" he said, noting with approval that they had resorted to a cart to carry everything they had brought with them.

"I have brought goodies," said Bshek. "Good friends—Fnork and Knara." The alien tilted its tentacle toward its companions, standing to its left. All three of them looked considerably frazzled, and Blackmore would have sworn that Bshek had lost fifteen or twenty pounds since yesterday. Apparently making "friends" was a bit more involved for them than it was for humans.

"Good food," said Bshek, waving toward a dozen or more metallic containers from which some incredibly spicy aromas were coming. Not bad, not bad. Blackmore vowed to run some of that through the medscanner to see if it was palatable for humans.

"And presents." Bshek indicated three rectangular boxes, about the size of shoe boxes.

Blackmore tried not to let his disappointment show. What could be in there? Certainly no self-replicating repairbots.

He didn't have to wait to find out. Bshek lifted the lid off one box and pulled out a fist-sized, milky stone dangling from a chain. A necklace? Or . . . .

"Washing substance on a tether," Bshek said proudly. "Good for showering. If you drop it, you need not bend over to pick it up."

"Oh," said Blackmore, smiling grimly.

continued on page 107

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

The Man Who Brought Down *The New York Times*

Paul Levinson

He came down the stairs, brandishing a copy of *The New York Times*.

I don't think I'd ever seen my father so angry.

"Nothing!" He threw the paper on to the kitchen table. "Not a word about my work!"

"Charles . . ." Mama stuck her head in from the dining room. "You can't control what they print. There's nothing you can do—"

"Oh, there's something I can do all right," Papa said. "They *promised* me. They *promised* they'd run the story this time. Bastards—"

Mama blushed.

Papa looked at me, standing by the door. "I'm sorry, Rebecca. I didn't mean to curse like that."

"It's OK, Papa. I once heard a boy say that in the schoolyard." I smiled my little girl smile. I'd always be his little girl. "It's hard being an inventor of something. My friend Janey once wrote a great poem—and it was so good, no one believed she really wrote it."

Mama was next to him now, her arms around him, trying to soothe him. "No one believes in people who invent things in their garages anymore. It's all big corporations now. No point beating your head against the wall."

"There's a point," Papa insisted. "What's the use of inventing anything if no one knows about it?"

"You can't really blame the newspapers," Mama said. "If you don't even have a patent, how can you expect the *Times* to—"

"Patent?" Papa yelped. "How am I supposed to go about getting a patent on this machine? Just file a blueprint of my design with the Patent Office? It's a *time machine* for God's sake! If someone else built it, if it fell into the wrong hands, it could wreak havoc on our world!"

"OK then," Mama said. "How about some good hot oatmeal for breakfast?" She gestured towards a simmering pot on the stove. "Let's sit down and eat. Forget about the *Times*. There's nothing you can do about it."

"Yes, there is." Papa sat down, ready to eat, but not mollified. "They *promised* me they'd print the story this time. Now they're going to pay."

Whatever Papa did to make the newspaper pay, it didn't take him away from home very much.

Or maybe it did, and I didn't understand.

I overheard snippets of conversation, coming out of their bedroom late at night.

"You see, dear, I could be gone for months, even years at a time, and you wouldn't notice the difference, because if I returned just a second after I left, it would seem to you and the world like I'd never been gone."

"Wouldn't you look older?" Mama asked.

"Well, I guess I would at that," Papa replied. "But do I?"

"No," Mama said.

"I guess that's because in fact I have not been gone for years or even months. I'm getting everything done in just a few hours or maybe a day or two each time. It's not that hard to trip them up on little things."

"I still don't like it," Mama said. "It's dangerous."

I can't recall the first time I noticed there that was a change in the world, because I guess it came on too gradually, like winter sometimes. One day I just re-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

alized that things had become different—people were just more irritable, more jumpy, than they used to be. As if they couldn't trust in things the way they used to.

It was harder to tell with Papa, because he was tired and irritable anyway from all of his travelling.

He'd get up very early some mornings, fetch the paper from the front porch, and take it upstairs to his den. And he'd come down a little while later, a look of determination on his face as he kissed Mama and me goodbye and walked out the door to the garage. And then the door would open again, just a minute or two after, and Papa would come back in. Sometimes with rain or even snow on his face, though the morning was bright and sunny. He'd look at Mama and me, and not say a word to us, though I once heard him mumble to himself as he walked back upstairs. "I'll see what the paper looks like tomorrow."

This went on for years and years. Papa was able to keep his job at the Post Office because the whole routine never took much of his time—he was never late. He gradually seemed to become more satisfied. He never spoke again of his time machine, or *The New York Times*. He just carried it with him, up and down those stairs . . .

Eventually I went away to college. Eventually Papa retired from the Post Office. Eventually he retired from his routine.

I have a husband and family of my own now. We live across the country. I come back every year with my husband and kids to visit Mama and Papa on the holidays.

I got a few minutes alone with Papa last December as he sat in his rocking chair on the front porch.

"It looks the same," he said, and pointed out to the lawn and beyond, "but somehow different."

"Well, it's a different world today, Papa. Not like it was when I was first growing up. Everyone's in a hurry today, rushing, pushing, shoving."

"Like they're afraid if they don't move quickly enough they'll make some terrible mistake," Papa said.

I looked at him.

"I guess it's my fault," he said.

"You can't know that for sure," I said.

"But I was right to do it!" He picked up a copy of *The New York Times* from underneath his chair. "They *promised* me they'd run the story. They *promised!*"

"I know, Papa."

"So, if they were going to lie to me, and the world, the least I could do was expose them for what they were. Maybe it undermined people's confidence in things, I don't know. But I had no choice. All the news that's fit to print? Hardly. All the omissions and errors that's fit to print—that's more like it!"

He pointed to a little box on the bottom of the front page.

"They didn't believe in my time machine? Well, I had the last laugh. I picked a story, a fact in a story, a quote in a story, each time I went out. And I went back just a little bit in time in my machine and changed it—so the *Times* wound up having it wrong. I did it with other newspapers too—they're all the same. And it embarrassed them, got them so jittery, that now they make mistakes all the time without my help. It's become the norm. They don't need me and my machine any more to make them look foolish."

His finger jabbed the bottom of the page. "*Errata*. Oh, they listed mistakes on their own, once in a while, before I got started. But now they're here on the front page almost every day. That's my lasting gift to the newspapers of the world. No one will ever really have confidence in them again. Just as it should be."■

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

The Missing Mass

Larry Niven

Illustration by Kelly Freas

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Is there a vaccine against culture shock?

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Midmorning Saturday, the fourth day after the landings, the Draco Tavern was frantic.

You never can tell how the biorhythms of a score of alien species will interact after the landers come down. None of them cycle through exactly twenty-four hours unless they medicate themselves. The first two days I'd been swamped in the mornings. The evenings had been half dead.

Gail, Jehaneh, and Herman were all on duty. Nearing noon, they seemed to have it under control. I could almost relax.

The Draco Tavern is all one room. During the remodeling the bar became a ring in the middle set higher than the main floor, to give me a chance to look around. This many disparate life-forms don't always get along. I've learned diplomacy. I've got stun gear, too.

Four Low Jumbos huddled close around a table, almost hiding it. Low Jumbos like crowds. They only show up when there's no room for them. Their bodies shook; the roar of their laughter leaked through the privacy shields as a synchronized bass *huf huf huf*. Their combined bulk nearly hid an entity their own size, the Terminator Beaver working with his computer against the west wall.

Ten Bebebebeque, sixteen-inch-tall golden bugs, perched around the rim of a table conversing with a Chirpsithra and a gray-and-pink jellyfish in a big glass tank of foamy water . . . big enough to crush my table, it looked like, so it must be sitting on a magnetic float. The jellyfish was new to me. Harsh blue light shone down from the top of the tank, illuminating an intricate internal structure and five dark, wiry tentacles knotted at the center. Evolution beneath a hot, fast-burning sun would explain why they hadn't adapted to the land . . . if there was land where they evolved. Water worlds seem to be common.

Jehaneh set a tray on their table. The water creature used skeletal Waldo arms to move a pink canapé through its little airlock. I watched the canapé slide into its translucent interior.

Jehaneh came back to the bar, looking pleasantly bemused. "Carpaccio flavored with sea salt," she said. "Do all the seagoing forms want red meat?"

"Mammal meat is higher energy than they're used to. They all have to try it, but it makes them hyper. Sometimes they get sick."

"I need four more sparkers," she said, "and four Bull Shots."

There were Chirpsithra at most of the tables. They're the ones who use the sparkers, and they make and run the interstellar ships. They look like attenuated crustaceans, three meters tall and higher, and red like a boiled lobster.

Four humans in Arab robes settled around a table. Iraqi seem to have rediscovered the pursuit of wisdom. Aliens made overtures, and they broke into pairs. Two joined the Low Jumbos. Two took high chairs to talk to a Chirpsithra.

A man stopped in shock in the double door airlock.

He didn't look like the usual run of xenobiologist or diplomat. Short, pale of skin, oriental eyes, straight black hair going gray, a comfortable old suit and weird tie, a laptop computer hanging from one hand. He wore the vague look of a scholar with a wandering mind. It took him a moment to recover his aplomb.

Then he made his circuitous way toward the bar, shying wide of aliens, *way* wide of the Folk, who laughed at him with lolling tongues, like a pack of wolves with their heads on upside down.

I was human. He was really, really glad to see me. He set the computer on the bar and asked, "Can you make me an Irish coffee?" English accent overlaid on something oriental. Having second thoughts, "Leave out the whiskey."

I told him, "I can do coffee any way you want it, or espresso, cappuccino—"

"Cappuccino would be perfect."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

He didn't try to talk over the shriek of live steam. He opened his laptop and booted it up. In the sudden quiet that followed he said, "I'm Roger Teng-Hui. I'm looking for someone."

I asked, "Human or alien?"

"E-mail correspondent," he said. "I'm looking for Helmuthdip." He turned the Toshiba around. He had World Online up and running.

I read an email message from <Helmuthdip@starlink.net>:

"If the Chirpsithra have such a power source, they may be willing to share it. A Human diplomat might ask."

I asked him, "Power source?"

"He thinks the Chirpsithra are using the energy of the vacuum."

I let that crypticism go past me. "When did you first contact this 'Helmuthdip'?"

"Wednesday evening."

"What's he want?"

"He seems to want me to put political pressure on the crew from that starship! At first he didn't mention politics, interstellar or otherwise. I took him for human."

The Chirp liner *Scrilbree Zesh* had been in place near the Moon last Tuesday morning. The landers were down before Wednesday noon. Give 'Helmuthdip' a couple of hours to buy a computer in Forelgrad and play with it a little . . . I said, "The timing's tight. You don't know the species?"

"I thought he was human! He had a website up, a discussion group on the problem of the missing mass. My filter program caught it. The site didn't look active. It was just him."

I waited.

"I didn't think I was dealing with a political pressure group. He *knew* things. He was *interested*. You know, a dedicated astrophysics site would have been *easy* before the Chirpsithra came. I've been teaching on PBS and the Net for twenty years. Most of my students have disappeared, and I'm the only teacher left."

Herman asked for Arabian coffee for the Iraqi. He took the tiny cups and went off, and I said, "I suppose the problem is that the Chirpsithra know it all."

Teng grimaced. "Do they really?"

"They say so. Their passengers say so. Sometimes they play jokes. I might buy that they know everything they want to," I said, "and what they don't know, their passengers know, and when they don't, they bluff. I'm used to it. I never thought about it from a teacher's viewpoint, but . . . it must be like everybody's sitting around waiting for the answers!"

"Flipping to the back of the book. Give me another cappuccino. Grand Marnier on the side. Do they ever make mistakes, or are all of these entities too advanced?"

"Oh, they make mistakes." A qarashteel had come to Earth to make cheap war movies . . . but I shouldn't blurt *that* out to just anyone. "Your alien would still have had to learn how to use the Internet. Maybe a human being showed him. Let me try something," I said. I linked into the Britannica's universal encyclopedia site, found what I wanted and turned the screen around.

" 'Helmuth speaks for Boskone.' Early science fiction. Helmuth was a space pirate, and a 'dip' is a pickpocket. You're looking for a spacegoing petty thief. Excuse me." Things had gotten busy around the big table, and I went off to deal with it.

The Draco Tavern has always been as much a fast food joint as a bar, but our supplies and capabilities have expanded over the years. We charge too much because we have to keep too much stuff around, and we have to be too careful what happens to it. Most of this stuff would poison most of the life-forms we get in here, and that *does* include the booze.

A Chirpsithra knew me, though I didn't recognize her. You can't tell Chirps apart; they're gene-engineered to identical perfection. I took the opportunity to

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

wave at the Low Jumbos and ask her, "Do they like crowds that much? Or should I be getting bigger tables?"

"You would not see the end of that endeavor! These—" Something breathy—"are not the largest of our clients!"

Other Chirps chittered laughter. One said, "There are life-forms that would not fit in any imaginable vehicle!"

The other, "But were they sapient? How could we ever know?"

Chirpsithra obscurities. I moved on. We were frantic for the next hour.

Then the Iraqi all rose and went out—prayer time, I guess—and suddenly most of the bar was getting up and walking, rolling, lurching, slithering through the airlock into a horizontal glare of Siberian tundra. The Low Jumbos followed the rest.

The jellyfish in his aquarium was still there. I wondered if he'd been abandoned. Five Chirpsithra who had watched their alien companions all go away, now gathered around the big table with the aquarium in the center. Herman glanced my way for permission. I thumbs-upped him. He pulled up a high chair and joined them. Something hairy came out of the restroom, looked around at the empty bar, then joined Herman and the chirps and jellyfish.

Jehaneh looked tired. I told her to go sack out. Gail went too. Roger Teng-Hui was still at the bar working his Toshiba. The Terminator Beaver was deeply involved with his Macintosh.

I stopped at the Beaver's table.

What showed of him was largely prosthetic. Under all the goo and wire and silver plating and small glowing icons the Terminator Beaver might have been a solitary Low Jumbo. He was half covered in tiny black platelets, half pink hide bared for prosthetics. Circuitry, lenses, armor covered his body. The material shone like glass and metal and jelly, but it all flexed. There was a narrow indicator strip above his small, neat carnivore's mouth, where he could read it with goggles like two silver eggs. The widgetry had a functional beauty implying, I thought, centuries of design. It hid most of his face.

Wires ran from a neck ring into the ports of the Macintosh. The screen was dancing, flickering, and his fingers never went near it.

He'd told us his name: a near-supersonic birdsong. He had been in the Draco Tavern since the landings, eating and drinking alone. He had bought the Macintosh laptop computer in Forelgrad, the merchant town that has grown up around the spaceport. Gail had shown him the basics during a dull evening. He'd become skilled very rapidly.

We'd speculated. The Draco Tavern's elaborate restroom isn't gender-specific, so we still didn't know *that*. Was he, she, it a cyborg by choice, a medical patient, geriatric case, augmented athlete? Was he a Low Jumbo avoiding eyes that might find him ugly?

He'd plugged his Mac into the wall, not into one of the universal sockets the Chirpsithra gave us, but into a telephone jack. I looked back toward the bar. Teng-Hui was around the other side, not visible.

The Beaver might well be the mysterious <Helmuthdip@starlink.net>. Did I want Teng-Hui to know that? Did I want to tell the Beaver about Teng-Hui?

I try not to get myself or the Tavern involved in these dominance games. Sometimes there's no helping it. And sometimes I can supplement our income by learning something valuable. I once went broke building a supercomputer, but that's also how I patented the magnetic float.

The game the Beaver was playing wasn't an action game, so I felt free to interrupt. "Terminator Beaver," I said, and let my translator whistle his name, "How are you doing?"

Let him take it either way: progress on the game, or was he thirsty?

He whistle-sang. His translator said, "Dead. Notice joke. I begin the game dead."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"Your character can still get hurt." He was playing *Grim Fandango* upgraded for 3D. I watched him trying to deal with the coroner and his flower beds. "Do you enjoy hints?"

"No."

"I need a hint to a puzzle. How good are you with that thing?"

"A fascinating toy."

"Have you had dealings with this entity?" I showed him the net address: <Helmuthdip@starlink.net>.

He asked, "Do you have access to this entity?" He typed it on the screen: <chinaRoger@wol.com>

"It may be. Describe what you want of him."

"A matter of negotiations. Rick Schumann, why should I tell you more?"

"'ChinaRoger' hasn't dealt with aliens."

"You have had much experience. I have funds if you will act as a mediator," said the Terminator Beaver.

"I've done that," I acknowledged. "How difficult is my task to be? Try to describe what you want of 'ChinaRoger'."

"I seek knowledge that would point to energy for industrial purposes."

Guessing, I asked, "Something to do with the missing mass?"

"I wondered if you merely pretended to knowledge. Would you accept one-over-twelve-cubed of net profits from this process over the next thousand years?"

I negotiated for half that, plus a modest thousand credits to be transferred at once. A bird in the hand, etc. The recording would serve as a contract if I brought these two together. I hadn't decided on that. Either way, I expected no profit from this.

Herman was getting recharged sparkers for his table. The Wheesthroo, the hairy guy, wanted an orange sherbet shake in odd proportions. I made that and Herman took it away.

Teng had waited patiently. I asked him, "What do you want with this Helmuthdip?"

"I want to know what *he* wants with *me*."

"What's he say he wants?"

"That's complicated."

"I'm not busy."

"I thought he was just another astrophysicist. But, look, I'm *Roger Teng-Hui*. Any decent astrophysicist knows who I am, and I'd know who he was. I don't mind 'Helmuthdip' hiding his name. But he knows of research I've never heard of, and there are terms he didn't know. *That* was funny. He wanted to talk about the expanding Universe, but he didn't know 'Hubble constant'. He knew 'missing mass', but he didn't know 'Casimir effect.'"

"I don't either."

"Ah. Look, this is fascinating stuff—" He caught himself. "Even now. Rick, the current most interesting question in astrophysics is, what is the nature of the expansion of the Universe? Will the Universe expand to infinity, or will it collapse back to a point? Most astrophysicists would like to find just enough matter to make space flat.

"Understand this picture? If the Universe is too massive, it'll expand for awhile and then fall back into a reverse Big Bang. If there's not enough mass, it'll be expanding toward infinite volume. Right between, it expands to a finite limit. That's flat space, right between infinite expansion and an eventual collapse, and it fits a cluster of theories built around an inflationary Universe. How fast we're expanding is the Hubble constant."

I did in fact understand him, but he didn't wait to find that out, he just raced on. "Now, the right amount of matter to do that depends on how fast the galaxies are going away from each other . . . the Hubble constant, right? The faster they're flying apart, the more energetic the Big Bang explosion must have been, and the more mass it will take to pull everything to a stop.

"The point is, none of the as-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

tronomers can find enough mass to do the job. Maybe we would have. Telescopes were getting better all the time, but then the Chirpsithra showed up—"

"Is this what was going on at 'Helmuthdip's' website?"

"Yes. I thought he was an amateur at first. Brilliant amateur. I was intrigued.

"The latest, most accurate measurement of the Hubble constant depends on Type 1A supernova explosions. Do you know how *that* works?" I shook my head. "Say you've got a bloated gas giant star losing mass to a white dwarf companion. The hot hydrogen gas rains down through an *amaz*ing gravity field, so it's heated to tens of millions of degrees. When it gets dense enough, you get a fusion bomb, *boom*.

"These Type 1A's all resemble each other, and they can be recognized across huge distances. The universe is full of them. A Type 1A supernova tells you how far away it is by how bright it is, and how fast it's moving by its red shift.

"Using those as meters to measure the universe, we get a rate of expansion that suggests around thirty percent of the mass that's needed to close the Universe, or ten percent, or seventy percent, depending on who needs a grant."

"So you look for more mass."

"Right! We look in places obscure and weird. We postulate mass we can't see, dark matter, in all sizes from neutrinos to intergalactic dust, to near infinities of brown dwarf stars, to hypothetical massive particles left over from the Big Bang itself. I wasn't a front runner in all this, but I kept track. And I got old, and we had too many solutions and none of them made a lot of sense. Aliens came down in Siberia, hordes of them, and they *knew*. So what was the point?

"Then 'Helmuthdip' popped up on my screen. And for awhile he was making sense, and then he got into the Casimir effect."

"What brought you here?"

"And then he started insisting that I use my *influence* on the pilots of an interstellar liner! *That* would have brought me here anyway, but *what* influence? If he comes from a place where astrophysicists have more power than fucking politicians, it's for damn sure he's from interstellar space! But I have to tell you about the Casimir effect."

"Do you really?"

"Actually," he said, "no. Let's leave it that there's energy in the vacuum. Fantastic levels. Space isn't really empty, it's a froth of virtual particles appearing and annihilating each other faster than any hypothetical instrument can detect them, and that's where the energy is. It's been demonstrated mathematically that if the vacuum in free space was empty of energy, you'd have *minus* energy near a black hole.

"The Casimir effect is an experiment that *measures* vacuum energy. You machine two plates very flat, and you move them very close together. They pull at each other—"

"Gravity?"

"No."

"Oh."

"It's done with virtual particles. Virtual particles flash into existence and annihilate each other everywhere in space. But you put these plates so close together that the wavelength between the two plates is too small. There's no room for virtual particles to pop up between them. The pressure on the outsides pushes the plates together, and that's the Casimir effect."

"Strong?"

"Tiny. 'Helmuthdip' has been trying to tell me—Is that entity waving at you? The half-mechanical, ah, person?"

The Terminator Beaver was on his feet and coming around the bar. I said, "Terminator Beaver, meet Roger Teng-Hui, also known as 'ChinaRoger'. Teng, meet 'Helmuthdip', aka Terminator Beaver. I believe you have much to discuss."

They sat at the bar with their computers in front of them, sometimes activating displays to supplement the Chirp-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

sithra translators. They both kept slipping into jargon, then remembered that they were talking to the bartender too. Sometimes it takes a third party to get two people talking the same language.

"The Chirpsithra won't discuss what powers their star-to-star liners," the Terminator Beaver said. "Our landers are various and we build them ourselves, but the liners have apparent infinite power and not enough fuel storage."

"Antimatter?" Teng asked.

"Antimatter they keep for attitude jets, with dross from refined sewage as reaction mass. Our *landers* use antimatter. Spies have identified a system aboard *Scrilbree Zesh* for making antimatter! Where do they get the energy? Many species wish to solve the puzzle. Sometimes we cooperate. We know that the liner's mass varies during a voyage, losing and gaining again."

"The energy of the vacuum is thinly spread," Teng said.

"By some measurements," the Beaver agreed. "Some theories render it huge. The Casimir effect may measure only the least of what is available."

I saw fit to cut in. "Near-infinite energy in the vacuum," I said, "And near-infinite energy in these huge Chirpsithra ships. That isn't all of your argument, is it? Because they don't have to be related."

They both tried to interrupt. The Beaver's translator cried, "No, no, no! What of the missing mass?"

"He was doing that before," Teng said. "It's an interesting . . . notion ."

"We must suppose that early Chirpsithra—" The Beaver saw us about to object. "No? Then think of engineers who find a way to attain the energy of the vacuum. When work is done, something always disappears, does it not? Not energy nor potential nor mass, unless one into the other, but something is gone."

"Entropy," Teng said. "Disorder increases. Energy becomes less available."

"Yes, but what is gone when energy is taken from the vacuum?" The Beaver's silver goggles flickered as he studied our faces. "You cannot pull energy from the same volume over and over!" he snapped. "Vacuum must disappear!"

I said, "Okay—"

"They learn the ultimate secret, these Engineers. They may be the first of many. Their numbers and ambitions expand. Peculiar and active galaxies may show their work. There is no missing mass," the Beaver said. "The Universe is expanding too fast, the Bang was too energetic, but expansion slows because space is disappearing. In the limit, space will be flat."

I asked, "Teng? Is this even sane?"

The man said, "Oh . . . sane. Look, there's no way you can take the same energy out of the same block of emptiness forever. Energy has to become less available. *Sure* something has to go, and it's probably volume. Space shrinks where the Engineers have passed. Why the Chirpsithra?"

"Look about you. *They* have such a power source! How many suspects can you identify?" the Beaver demanded, rather unfairly, since the bar had been nearly emptied.

Teng said, "Well, that's my point. This universe has had around ten to the tenth years to produce a species capable of using the energy of the vacuum. We expect the Universe to last . . . how long before interesting things stop happening? Ten to the fortieth years? Ten to the ten to the eighty? We are in the earliest moment of the Universe. Most of time is in front of us. The Engineers might not even have a planet to evolve on yet!"

I said to the Beaver, "You have asked, haven't you?"

"To us the Chirpsithra said nothing. To another race they once said that the secret of their drive was to be taken as a puzzle. 'Just another cursed intelligence test.'"

Teng burst out, "Your damn hypothesis isn't even falsifiable!"

I asked, "What?"

"When you've got a decent theory,

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

you try to falsify it, Rick. You don't want someone else making you look like a fool, so you try to disprove it yourself first. If a statement *can't* be disproved, falsified *if* it's false, it's useless. Beaver, if the Engineers won't start chewing up galaxies for a trillion trillion years, what evidence would you expect to find now?

"Any species may ask."

"Not us," Teng said, suddenly bitter. "There weren't even human footprints on Mars when the Chirpsithra came. If ever there are, they'll be around a Chirpsithra landing site. Passengers. Why would they give *us* an interstellar drive? We can't even build landers, and they use antimatter just for reaction jets!"

I made two cappuccinos while I thought. All talk stopped in the scream of steam.

It seems I'm doomed to spend my life with entities brighter and more knowledgeable than myself. They gather to talk, all these different shapes and minds, and I am privileged to listen. I love it. But sometimes they talk and talk, and never act.

A mathematician once told me that all of math is a mind game. The strangest thing is that any of mathematics can be fitted into the way any part of the Universe behaves. The huge vacuum energies that fall out of mathematical formulations needn't be taken seriously. I knew that without ever seeing the equations, let alone being able to read them.

Then again . . . "Come with me," I said. "Let me do the talking. Teng, you may not know it, but any ongoing conversation should not be interrupted. It's a custom."

"Right. What have you got in mind?" But I was in motion, and what I had in mind was very little.

The big table was down to Herman, three Chirpsithras, the silent Wheesthroo, and the big jellyfish in his aquarium jar. I placed the cappuccinos and pulled up high chairs for the rest of us. One of the Chirps was chittering. My translator said, "Not all of the life-forms known to us enter the Draco Tavern. Poseidon masses as much as *Scrilbree Zesh* itself." *Scrilbree Zesh* was the big ship still orbiting the Moon.

The jellyfish spoke like a snore. Its translator asked, "But this entity could visit Poseidon?"

"One of our ships might cross to Poseidon's world. We would prefer to visit Poseidon before he dies. Wait but a moment." The Chirp's monitor strip twinkled.

Herman took the opportunity to half-whisper, "We've been talking about water worlds. That's Scylla. Nothing to trade, but supposed to be a poet. Poseidon lives on a water world not far from here. He's huge."

The Chirp said, "No such voyage is now planned. Learning to talk again to another of his species would be tedious, but we estimate Poseidon's lifespan in the thousands of years."

"But mine is not," Scylla the jellyfish said.

"We are sorry. Greeting, Rick."

"Greeting, elder. Greet Roger Teng-Hui and the Terminator Beaver."

"Greet you both. Greet Scylla, whose kind only recently made fire. A great accomplishment it was."

We spoke; the translators spoke; talk grew raucous, then stalled. Into a moment's pause I asked, "What's the largest life-form the Chirpsithra know of?"

"Extinct now," the Chirp said. "They were larger than galaxies. They formed the galaxies. Your telescopes will one day be powerful enough to watch them. Would you witness this now?"

Teng wanted to speak. The Beaver wanted to speak. But they both looked at me first, and Scylla's snore rang out. "Please show us this wonder."

"Our monitors . . . but you have a local computer, I see." The creature's long red armored hand reached out for the Beaver's Macintosh computer and opened it facing the jellyfish. "Do not disconnect." The Chirp produced a little

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

box of its own and plugged it into a piece of the Beaver's equipment. Her fingers played over a surface.

The Beaver was still attached; he twitched. The Mac's screen raced, went black, then blue-white. "Fast-forward," the Chirp said.

We watched. A wash of violet light dimmed to blue, to green, to yellow, then broke into an expanding chaos of filaments and dimmed further.

The Chirp's translator spoke. "Roger Teng-Hui, how do galaxies form?"

Teng said, "It's a puzzle. Current attempts to model the early Universe usually give us a Universe that is too uniform to form galaxies. Inflationary theories make galaxies more likely. It's one of the attractive things about inflation."

She said, "You have not yet seen the Universe forming. It *was* too uniform. Without galaxies there would be few stars, yet galaxies would never form. But like all here—even Scylla, whose sea-locked kind breed transparent jellyfish to make ever more powerful telescopes—we became able to watch."

Out of the chaos came whirlpools of light.

"It may be you cannot see the mechanism. Teng, your people have wondered about the missing mass." Teng recoiled; she chittered laughter. "What is unfalsifiable might still be proven true."

"You've been eavesdropping," I said.

"Our translators note key phrases, as 'missing mass' in conjunction with 'energy of empty space'. If engineers must use the power in the vacuum, and those engineers are yet to evolve, then they will be undiscoverable. But these lifeforms we call the Firstborn evolved very early. They *metabolized* the energy of the vacuum. Wherever there was a bloom of Firstborn, an orgy of uncontrolled breeding, there too were sudden concentrations of mass. Disappearance of volume leaves mass behind, yes? There sudden stars flowered.

"We would study the Firstborn further, but we cannot find them. We fear them extinct. The rage of light and heat may kill them when galaxies form, or else matter around them might grow denser until a black hole swallows all, and remains behind to anchor a galaxy.

"Yet we hope that they still survive between galactic clusters. See this great emptiness—" She showed us on the Mac, a vast hole in the Universe where there were no galactic clusters. "We have never traveled that far. If we could study the Firstborn, we might learn their secret."

The Beaver demanded, "But what drives your ships?"

"Our ships use a lesser effect. The Firstborn hold the key to vast wealth. If we have not learned it, *we*, in our billions of years . . . well. Some younger race might. Teng, Beaver, Rick, it is not in our interest that you should give up striving."

Scylla's magnetic floatplate floated out from under the table, and she drifted out onto the tundra. The rest followed. I watched them go, thinking that we must be a common thing to the Chirpsithra. A civilization is only beginning to learn the structure of the Universe, when interstellar liners appear and alien intelligences blurt out all the undiscovered secrets.

Primitive peoples die when powerful intruders mock their lifestyles. Whole worlds might be saved, if Chirp diplomats can be trained to imply that vast secrets remain untapped, awaiting the touch of young and ambitious minds.

"Paid you too much," the Beaver told me. "Did you *see* animals the size of a galaxy? I did not. I saw blobs and colors." He ambled out.

Teng caught up with him. I heard him say, "Let's think about expanding that 'Helmuthdip' website. Get some of my colleagues involved. Maybe some passengers too." Teng was bouncing, his spirits restored. In a young Universe there were still wonders to achieve, secrets for a young species to learn.

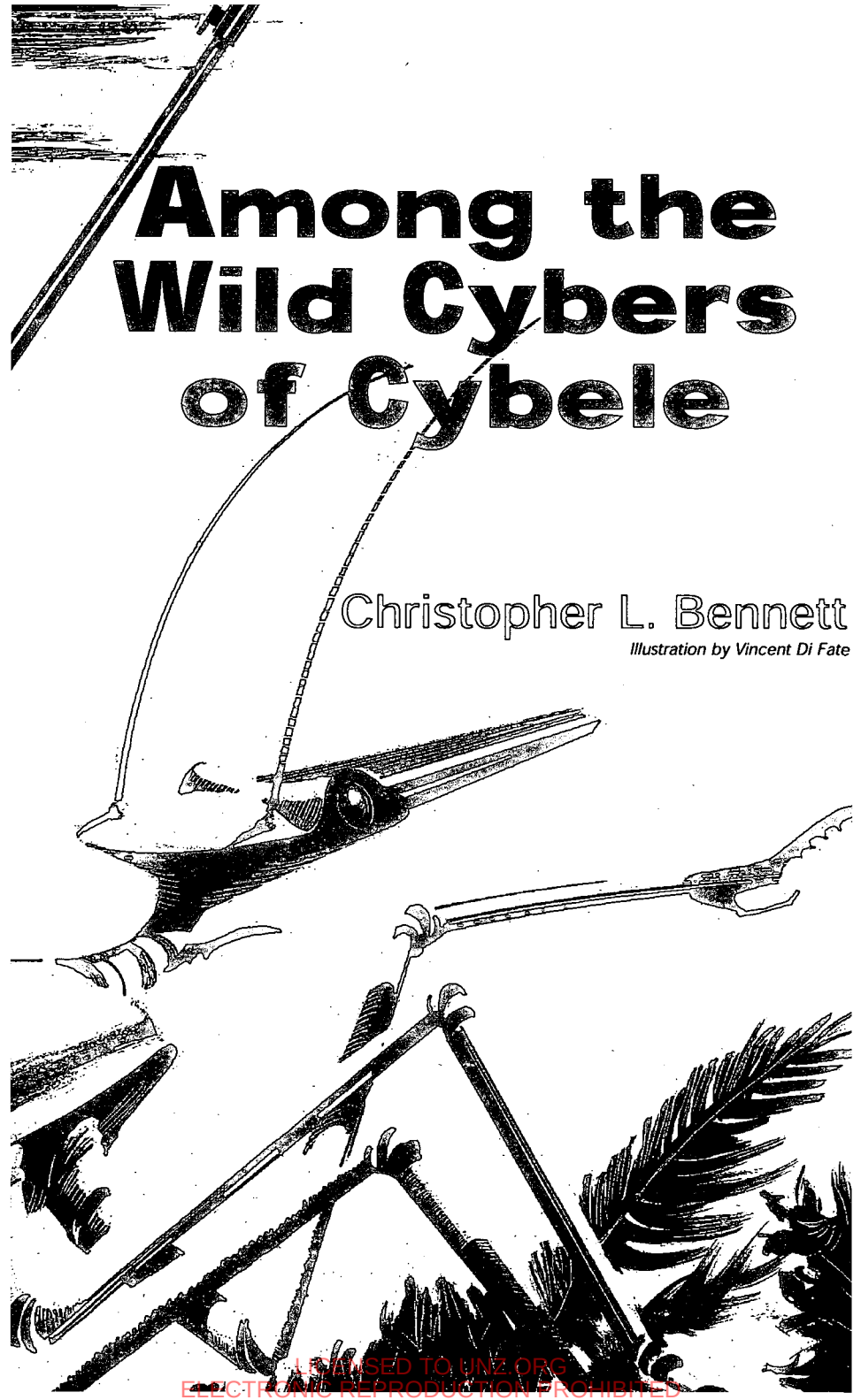
LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

LICENSED TO GMZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Among the Wild Cybers of Cybele

Christopher L. Bennett

Illustration by Vincent Di Fate



LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

From the journals of Safira Kimenye, 14/13/004 Anno Cybelei (10 November 2250 Solsys Equivalent Date):

During today's foraging, the loggers were attacked by a fandancer. They must have intruded onto its territory; the vertebrates don't hunt by magnetic fields, so it couldn't have found them appetizing. This was a large species of fandancer, with sharp tusks and a bony club at the end of its tail. It inflicted some damage—mainly on Bunyan, ever the bold and reckless one. Galadriel called a retreat—I picked up the signal on my earphone—but the biped hounded us relentlessly. Perhaps its terror at the alienness of the loggers drove it to such violence.

So the loggers lured it onto a compass rose. With my more limited senses, I couldn't detect the sedentary arthropod; its chitin camouflage blended perfectly with the grass. I saw them luring the 'dancer toward a particular patch of ground, but I was startled when that patch snapped shut, leaving a bare starburst pattern in the grass and trapping the fandancer inside a nearly solid, spherical cage of segmented limbs.

As we left, I could still hear the 'dancer fighting to break free from the compass rose. I can't help hoping it succeeds. It was only defending its territory—maybe even defending young. And dying slowly of thirst is a nasty way to go. But as I keep reminding myself, it's not my place or anyone else's to referee nature's battles.

Well. I'll be glad when Marc gets here. His enthusiasm always lifted my spirits. And having his support in this difficult cause will make the work easier.

Safira looked just as Marc Dupuis remembered: a tall, elegant woman with regal African features and a blinding smile. She engulfed him with a warm embrace the likes of which he'd only dreamt of as her graduate assistant. But such fantasies were a decade behind him now—well, four decades, counting the long sleep from Earth to Cybele. He wasn't here to moon over Safira Kimenye, but to do a crucial and very delicate job. He returned the embrace with merely professional courtesy.

"It is *so* good to see a human face again," Safira beamed, "especially a friendly one. I'm so glad you're here."

"Really?" Marc teased gently. "I've kept up with your journal entries on CybeleNet. It sounds like the loggers have made you part of the family. You sure I won't just get in the way?"

"Oh, they're charming companions, all right. But I miss a human voice, the warmth of a friendly touch." She clasped his hands a moment longer, then helped him gather up the supplies that had come with him. They both took great care; it usually took weeks or even months for Safira's diffuse support network to track down the peripatetic researcher, so these supplies would have to last them both. Before leaving the drop site, Safira deposited a data crystal containing her latest journal entries for later pickup. It was an awkward way to transmit data, but of course Safira had disabled her wristcom's transceiver circuits to keep the wrong people from tracking her down.

The trip to the loggers' camp was a convoluted twilight journey through a forest of purple-trimmed bamboo-ferns. On the way, Safira and Marc caught up on the news since they'd last met eight long Cybeline months ago, shortly before Safira's expedition had begun. But glimpses of the forest denizens kept them distracted. Arthropods of countless shapes and sizes swarmed through the forest, their developed lungs and circulatory systems letting them greatly outgrow their Terrestrial analogues. Sparrowasps, scorpionflies and dragonmoths hummed through the air, reveling in a niche undiscovered by the native vertebrates. After all, the tailed vertebrates had only two limbs a piece, adequate for 78-percent gravity; and evolv-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ing wings would leave them without a leg to stand on.

Yet the vertebrates were not completely grounded. Some could rear up on strong tails and climb the bamboo-ferns with grasping feet; others could leap into the lateral fern stalks and brachiate with prehensile trunks and tails. One species employed the implausible technique of flipping upward and hanging from the stalks by its legs, making its way blithely upside-down.

Safira frowned at Marc's quiet absorption of this image, which evoked hilarity in most observers. "Are you all right?" she asked. "You were always so eager, so excited by new discoveries. You seem more . . . subdued now."

Marc was silent for a moment. "Well . . . I suppose I've got some things on my mind. Like how you'll convince the loggers they can trust a human other than you. Although," he smirked, "it can't be much harder than what I went through to earn your helpers' trust. They're. . . . understandably protective of your charges. Without your endorsement, I doubt—"

"Think nothing of it," the older woman smiled. "And that goes for both issues. I had to win the loggers' trust the hard way—teaching them to accept me and avoid others like me at the same time. But there's a shortcut for you." She unpocketed a small device on a chain which she draped around his neck. "This transmits a copy of their recognition signals. Admittedly I haven't tested it, but it should ease your acceptance greatly."

"I can see why you haven't mentioned this in your journals," Marc said thoughtfully. "You don't want the hunters getting hold of this."

"No, it's not what I'd particularly prefer to get around their necks." The uncharacteristic anger barely reached her voice, but it burned in her dark eyes. "Never mind," she smiled, shaking it off. "We're almost there!"

They shortly emerged into a clearing dominated by (and presumably resulting from) a large, strikingly regular stockade of bamboo-fern stalks. "That looks like it could keep out an army of arthropods," Marc observed.

"It does. Routinely. The pincer-hounds find the loggers' magnetic fields particularly appetizing. And it's stronger than it looks."

"Right. The coating they secrete." As they drew nearer, Marc could see the crystalline sheen on the stalks. "Remarkable."

"Especially when you consider that the loggers are descended from survey probes, not builders. Their construction skills evolved purely as a defense mechanism."

Suddenly, a disguised hatch in the ground tilted open, and the loggers began to emerge. "They know I'm back," Safira said. "But they're wary of you," she added as the low-slung hexapods pulled up short of the humans.

"Perhaps I should keep my distance for a while," Marc suggested. "There's a tent for me in with the supplies. I could sleep out here tonight."

Safira had gone up to the troop leader and was stroking its gleaming carapace soothingly. "Don't worry," she said, seeming to address both human and logger. "They're already letting you closer than they'd let anyone else."

"Still, I'd rather not press my luck," Marc shrugged. "After all, those cutting arms of theirs are diamond-tipped."

"Don't be silly. For all the evolution they've undergone, their First-Law programming's still in effect. They won't hurt you." She caressed the blocky creatures of crystal and polymer like beloved children.

Safira soon persuaded Marc he would be safer within the compound. It was already too cool for the arthropods to remain active, but some vertebrates hunted by night. So, with delicacy, Safira led Marc and the loggers through a halting introduction, built around human ap-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

proximations of the loggers' submission behaviors. Much of their communication was electromagnetic, but the emitter around Marc's neck took care of that. Besides, the loggers' neural nets adapted quickly to new data. So, far sooner than would have been possible with biological animals, Marc was granted clearance into the sanctum.

The entrance tunnel was cleaner than he'd expected, the loggers having coated it with their plasticrystal secretion for stability. The interior space was broken by a regular grid of sharpened, crystal-coated poles pointing skyward. Its only other distinct feature (aside from Safira's campsite) was a materials dump, presumably supplying the auxons' building projects as well as their self-replication. Along with bamboo-fern stalks, polegrass and the like, Marc saw stones, animal remains, and some fragments of auxon bodies. He assumed these must be scavenged, since the loggers weren't predatory.

Following his gaze, Safira explained, "We were attacked by a heliraptor yesterday. Until then, the stockade hadn't been designed to keep out flying creatures. The 'raptors have scared off most of the airborne arthropods hereabouts, and they usually haven't preyed on their own relatives before. This one must've been either newly evolved or newly migrated to the area. It was certainly the biggest I've seen."

"It inflicted casualties?"

"Nothing fatal," Safira smiled. "It used a laser weapon, a mutated altimeter beam, I'd guess. Several loggers were injured—especially brave old Bunyan, of course. But they fashioned some polegrass stalks into crude spears. They managed to snarl the 'raptor's left rotor when the spears got caught between the blade and cowling. It went into a spin, but reacted quickly, of course, and managed to adjust its airfoils and limp away. And I soon heard the squeals of a rhinostrich. Not as good a source of replication material as another auxon—but certainly an easier kill," she finished proudly.

Marc surveyed the logger troop. "They seem pretty well-repaired now."

"The females did their job well." The "females" were those members of the self-replicating (or auxonic) cyberspecies who actually possessed the replication and repair equipment. The majority were made without such equipment to save materials. Upon their deaths, the females digested their remains and downloaded their acquired data, learning from their experiences and mistakes, and redesigning the next generation to be better adapted to their environment.

"Bunyan got a leg cut off," Safira went on, "but he resisted having it replaced. Maybe I'm anthropomorphizing, but I don't think he liked being cheated out of another battle scar."

"Hm," Marc pondered. "Would vanity evolve in a basically asexual species, without the need to attract mates?"

"I think evidence of toughness and courage demonstrates his importance to the group, so he gets allocated more resources. Also, it demonstrates that his design is successful, so it might be favored in reproductive selection."

Marc took a moment to absorb the intriguing idea, then studied the defensive palisades. "So these were erected after the attack?" Safira nodded. "You think they'll keep the heliraptors out?"

"The plasticrystal will resist their lasers, so they can't be cut down easily. But 'raptors can hover and maneuver quite well. They should be able to work around this barrier." She smiled. "And then the loggers will develop a more elaborate one. They can't anticipate, but they learn quickly from experience."

Marc found himself alongside the materials dump, contemplating what must be Bunyan's severed leg. "I keep wondering," he mused, "if the auxons might evolve to build themselves out of the same near-indestructible materials they used to build our cities. I mean, they al-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ready have diamite claws and fullerene muscles; why not go the rest of the way?"

"Because they were designed to evolve," Safira said. "And that means they had to be vulnerable. Death is a tool of evolution," she sighed philosophically. "It's what weeds out the failures to make room for the successes. If they were indestructible, there'd be no selection mechanism, and they wouldn't adapt." The probes' designers back in Sol System couldn't have anticipated all the conditions of an alien world. So, since they were sending self-replicating probes anyway (a few seed units being more economical than an army of drones), they had given them the ability to evolve, using both random Darwinian mutation and the more Lamarckian ability to modify their offspring based on experience. It was hardly a new idea; cyberengineers had known for centuries that evolving hardware or software often produced more effective design solutions than a conscious creative process (one more nail in the creationists' coffin, though the creationists still denied it).

"We know that," Marc countered, "but the auxons don't. They don't see the bigger picture, they just try to perpetuate themselves. An indestructible species might be an evolutionary cul-de-sac, but it'd be an enduring one."

"But it takes more effort to bond the atoms for such materials. More time and energy to craft them. They built our cities from those materials because we programmed them to. But now they're ruled by pragmatism, not programming. They perpetuate their 'genes' just fine without being indestructible. So there's no point in wasting the energy to make themselves stronger than they need to be. Any more than in us having armor shells and five hearts."

She shook her head. "That's the flaw with the government's propaganda about how the auxons will destroy the whole biosphere. They're not that superior. They obey the same natural laws as any animals. But no matter how much I stress that in my journals," she grimaced, "Berdahl and his people cling to their paranoia, and their mad campaign to exterminate the whole kingdom of auxonic life!"

Marc fell silent; the anger in her bearing demanded a respectful distance. Her intensity was beautiful, he thought, but forbidding, like a mother tiger's. As much as he admired the sight, he had to turn away to hide his concern. With such passion for her cause, it would hurt her all the more when she learned of his betrayal.

It was early autumn in this hemisphere, and the mornings were chilly. Gamma Leporis was hotter than Sol, but Cybele was its fifth world, receiving only three-fourths the illumination of Earth. The seventeen-hour nights didn't help either. Still, the only place to bathe was a frigid stream, and it had to be done in the morning before the arthropods warmed to the hunt.

The cold water helped distract Marc from Safira's graceful bronze body. A decade past he'd have craved the sight and more. But this was supposed to be a professional relationship—even aside from his hidden agenda.

He continued to tell himself he wasn't really betraying her—that he acted out of respect and concern for her. He wanted the same thing Governor Berdahl did: not only to save their adopted planet from ecological catastrophe, but to save their mutual friend Safira from the horrible mistake she was making. Now she was blinded by her scientific fascination, her closeness to the auxons; but in the long term her wisdom would prevail and she'd understand that they'd acted for the best. He knew, though, that she would resent him for quite a while once his deception became clear. It would only worsen matters if he assumed the role of lover as well as ally.

Marc therefore strove to take their

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

mutual nudity in stride. So it came as a surprise when he realized she was studying his body with open interest. "What?" she smirked when she got around to noticing his questioning expression.

"You . . . never looked at me that way back on Earth," he answered guardedly.

"My dear, you were barely more than a child then."

"And now?"

She appraised his anatomy frankly. "Grown up nicely," she grinned. "Oh, don't be so surprised. I haven't had a man in nearly a Terran year."

A number of emotions roiled through Marc, none presenting a clear course of action. But then Safira's attention was drawn elsewhere. "Hear that stridulation?" she whispered. "The pincer-hounds are stirring. We'd better get to the stockade." She strode determinedly past him toward shore . . . but gave him a swat on the rump which clearly said, "Later."

With the pack of pincer-hounds figuratively barking at the gate, there was nothing to do but wait inside the stockade and talk. Safira seemed happy to continue her bald flirtation, but the loud washboard growling from outside gave Marc a convenient (and truthful) excuse for not being in the mood. He knew he was in no danger, but the sound was like chalk on a blackboard, only in bass.

The loggers seemed relaxed but alert. Guided by the alpha female Galadriel, they made well-practiced (or instinctively programmed?) rounds, checking the integrity of their defenses. Amidst it all, though, Marc saw behavior uncannily resembling ritual comfort and bonding. He tried to take it in stride; after all, the loggers had evolved along a social model, and such behaviors were functional within that model. It was simply a logical outgrowth of a stochastic selection process, he told himself, and no reason to feel sympathy for the cybernetic probes. Especially since he knew what was coming.

In fact, it came sooner than he'd expected. Safira and the loggers reacted to the airborne engine sound before he noticed it, launching into a flurry of movement. "Another heliraptor?" he ventured innocently.

"Hunter drones," Safira snarled. "Shit, how did they find us so soon?" She pulled two plasma rifles from a case. Marc's eyes widened at the restricted weapons—and widened further when she tossed him one. "Aim for the optics! Only part they can't shield fully from the EM pulse."

"I, I've never used a gun!"

"Life is learning. Figure it out!"

In moments, the hunter drones came into range and started firing plasma bolts of their own, each mini-fireball making a curt *whoosh* like a whirling torch on fast playback. The pincer-hounds' grating chorus fell into disarray as the arthropods fled.

The loggers used the defense tactics they'd developed against the heliraptor, hurling polegrass spears along with rocks and stalk fragments. But the hunter drones had enclosed VTOL jets rather than open rotors; and the remote-controlled, nonevolving weapon platforms lacked the inbuilt vulnerability of the auxons. The drones took the loggers' attack unfazed and blasted back with much deadlier efficacy.

Safira shrieked as the first logger died, the bark of her plasma rifle meshing with her cry in bellicose harmony. Her skill was disturbingly good, and she blasted several drones squarely "between the eyes," scrambling their power systems and felling them. Marc fired toward the drones, trying to appear helpful without actually helping. His novice aim served this purpose well, enabling him to shoot in earnest and even broadside a drone or two without making a kill.

But his attack did have an effect. One of the drones he'd grazed turned and closed on him. Before he realized what

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

was happening, Safira was bearing him to the ground, her close-cropped hair made a halo by the actinic bolt passing just beyond it—the bolt which had been aimed at his own skull.

He gasped, at the unexpected attack, at the shock of impact with the ground, and at the pressure of Safira's firm, warm body against his. Their eyes met and locked, frozen by the moment.

The kiss was spontaneous, surprising, and deeply unwise under fire. Marc was even more surprised to realize he had initiated it. Safira returned it electrifyingly for two seconds, then rolled off and blasted the drone's brains out.

As Safira executed the remaining attackers with efficient, maternal fury, Marc lay on the ground trying to absorb the event. That drone's operator had tried to kill him! He'd known emotions were running high, but he'd never expected such unbridled hostility from his own side. He knew Governor Berdahl would severely punish that hunter . . . but it made things a lot less clear-cut to realize there were fanatics on both sides.

In the end, there were two logger fatalities, whom Safira eulogized as Legolas and Daphne. The loss of a female hit her hard, for they were the least expendable, but she grieved equally for them both. There was no ceremony on the loggers' part; the females simply consumed the corpses for material with which to repair the numerous injuries sustained in the attack.

Bunyan had lost a cutter arm this time, and been blinded in his rear optics. His carapace was partially melted, and his awkward gait suggested neurological damage. It amazed Marc that the battered cyber was still functional. When Safira cuddled the cold, hard mechanism and spoke fondly of his "indomitable spirit," he found it hard to retain his skepticism.

But repairs would have to wait, since the hunters knew their location now. The stockade was evacuated with no sentiment and minimal preparation—primarily the swift construction of a litter for Safira and Marc, to prevent them from leaving a chemical spoor. Safira had taught them this, but they now did it on their own initiative. The litter rode atop the carapaces of several large females. Safira and Marc had to cling tightly; the ride was remarkably smooth, but that was largely cancelled by the swift pace of the journey over variable terrain.

Galadriel took the lead, with Bunyan on her back. As the troop's prime defender, he headed the repair list. Already she was secreting around him the conductive gel which carried her repair nanites, while fine manipulator arms attended to macrorepairs. Other males formed a defense perimeter, alert for attack, while a few straggled behind to erase their trail, even to the extent of performing nanorepairs on broken plants. (Safira hadn't taught them that; it was a naturally evolved defense.)

Although they used the forest's purple foliage for cover, Safira scanned the sky for more hunter drones, weapon at the ready. "I don't know what I'll do once the planetwide satellite network's in place," she sighed at one point. "But we must carry on," she then smiled, placing her hand supportively on his. "The cause is too important to abandon, no matter how impossible it may become."

Marc couldn't help but clasp her hand warmly in return. "I don't think it's in your nature to give up, Safira. The more impossible a cause, the harder you work to succeed. That's why there are black rhinos in Africa again."

She returned his gaze with gratitude and warmth. Their hands remained clasped, and soon their lips met. They still had to cling to the litter, so they couldn't do much more; but it was enough to kiss for hours. When the troop finally stopped for the night, Safira and Marc were stripping and devouring each other before the litter touched the ground.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

It was just sex, Marc insisted to himself as they lay comfortably intertwined the next morning. Just the natural response of a woman who'd been alone too long and a man who owed her his life. It was a perfectly understandable indulgence, and no strings need attach. He knew he could credibly pull back to a professional remove without complicating things further.

He had to admit, he was having doubts about his cause following the attack and his time with the loggers. But second thoughts were moot; the betrayal had been complete the day they'd met. All he could do now was try to minimize her pain.

Perhaps he could raise doubts in her mind about the auxons she so cherished—remind her of the stakes involved in their existence. Best, though, to start on peripheral questions. "Have you ever wondered," he began, "whether the auxon probes that were sent to other worlds might've undergone the same kind of evolutionary process as these did? Whether other colonists might have to face these same problems?"

Safira maneuvered to meet his eyes, her body sliding quite distractingly across his. "I've thought about it," she said. "But I think there were a few unusual things about Cybele. Aside from the tectonic activity, there was the sheer bad luck of having magnetic-sensitive predators who found the auxons' fields appetizing. That increased the attrition rate, and increased the likelihood of non-dormant probes evolving." The probes had been designed to fall dormant once their programmed tasks had been completed—while allowing new replication to balance whatever attrition might occur, so enough probes would be available to survey habitation sites and build cities upon receiving the command from Solsys.

"But other worlds might have their own dangers," Marc countered. "If attrition were excessive, the probes there might also mutate into nondormant forms, the better to avoid danger."

"True."

"And then a situation like Cybele's might be inevitable," he continued. "Without a mission to direct them, the auxons' preset behaviors would only last until they clashed with pure survival—whereupon they'd be weeded out in favor of more successful mutations. Eventually they'd end up with the same kinds of survival-driven behaviors as living animals, filling all the natural ecological niches: herbivores, scavengers . . . predators. Coming into competition with the native forms," he finished significantly.

Safira didn't pick up on this, perhaps deliberately. "I don't know if they'd evolve predation without first being preyed upon. What are the odds that another world would have magnetic-sensitive predators?"

"Some animals might attack them out of fear or territoriality. They might occasionally kill an attacker, and eventually they'd figure out that animal corpses are rich in the carbon and other elements they need for replication. Or they might discover it while sampling corpses, evolve into scavengers and then hunters."

"You're right," Safira smiled. "Life always manages to fill whatever spaces it can find, and follows many paths to do so." She pursed her lips thoughtfully, alluringly. "But would they have the time? If *Arachne* had gotten here seventy years ago as planned, it would've found most of the auxons still dormant and awaiting instructions. The few active mutants would've been recycled and never gotten the chance to evolve further." The original colony ship *Arachne* had vanished mysteriously en route to Gamma Leporis. The disappearance had never been explained, but it hadn't kept the more advanced *Anansi* expedition from making a second, successful try. "Maybe if the planet were farther away, with a longer interval before the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

colonists arrived . . . But ten parsecs is pushing the limits of practical colonizing range. There weren't many probes sent farther out than here."

Marc had to concede her point; in fact, he welcomed it. He wouldn't wish Cybele's crises on another planet. Beyond that, though, he found himself simply enjoying the moment. Here were a nude man and woman, wrapped in each other's limbs, casually discussing science and philosophy. It wasn't much like his grad-student fantasies of Safira, but it felt very right to the more mature Marc—an easy, comfortable union of erotic and intellectual rapports. Not a transient passion which would serve its purpose and burn out . . . more like the basis for a lasting, meaningful relationship.

Inarguably, he had to nip this in the bud. He'd served his purpose; he should leave now, before the other shoe fell on Safira.

But as he gazed into her dark, brilliant eyes, leaving seemed impossible.

Marc had convinced himself there were quite valid reasons to stay with Safira until the endgame. First, there was the concern that another hunter-drone operator might lose control. Marc felt it best to stay for her protection (conveniently forgetting who'd protected whom before). Also, he still hoped he could convince her to see his side, to surrender voluntarily and spare him her betrayed wrath.

On top of that, he was simply fascinated by the wildlife of Cybele, and their journey through the violet-hued wilds provided ample opportunity for observation. Safira focused more on the auxon species, but Marc was fascinated by the native fauna, the rich variations on the themes of arthropod and vertebrate. While only the arthropods flew, many grew vast and sedentary, such as the crabtrees, whose segmented limbs were camouflaged as bamboo-ferns, trapping prey in chitinous "fronds" and digesting them in Venus's-flytrap style.

The vertebrates had their differences too, as dramatized in a battle between a fandancer and an eleroo, champions of two distinct taxonomic orders. The stiff-tailed, scaly eleroo grabbed and struck with twin prehensile probosces, leaping spryly about its foe, sometimes spinning to use its heavy tail as a truncheon. The downy-furred fandancer lashed forward with its more flexible tail, its fans of extended ribs pivoting back to keep the biped in balance. At times it would switch tactics, balancing with its rearthrust tail while swiping its ribfans forward to slash with sharpened tips. The pointed arguments of its ribs and tusks finally won out over the blunter attacks of the eleroo's trunks and tail, the scaled megalopod falling victim to blood loss. The 'dancer's bright fans fluttered in triumph (and warning to scavengers) as it tore into its kill.

The greatest discovery, for Safira and Marc alike, was also courtesy of the fandancer genus. The humans were among a grove of honeycomb stalks when they observed a small troupe of 'dancers with unusually large ribfans. The troupe seemed interested in the scorpionflies which rested in the fern-tufts—vivid green arthropods with meter-wide dragonfly wings, froglike eyes and writhing tails. The scientists watched from the natural blind of the honeycombs as one fandancer hefted a rock in its tail and hurled it at the stalks. The impact startled the scorpflies into the air, and the 'dancers launched into pursuit. Literally launched—after running up to top speed, they leapt skyward, thrusting down with their broad fans for extra lift. Spreading their fans wide to slow their descent, they managed to take several scorpflies from the air before drifting back to the ground.

Safira was gasping with ecstasy, while Marc was struck dumb with awe. "Do you realize what we just saw?" Safira crowed when she caught her breath, never mind that it spooked the 'dancers.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"We've just witnessed the first phase in the evolution of vertebrate flight on Cybele!" She laughed hysterically. "This is . . . this is history! This is the kind of moment a naturalist lives for. That we would be here to witness such a key moment in evolution . . . oh, my . . . " She babbled on in Swahili for a bit, most of it gleeful profanity, and then just gave up talking and assailed him with hugs and kisses.

Marc had tried to return to a professional distance, with limited success due to the decades of seductive skill which she happily wielded against his defenses. But that had been casual play compared to this. Equally overwhelmed by the thrill of this discovery, they found themselves overwhelmed by each other as well. The joy of the experience evolved into joy at sharing it, at sharing each other, and they delineated that joy with their bodies until the slow-moving sun sank below the horizon.

"Ohh, Marc," Safira sighed at length, when her body was too tired to continue its more eloquent communication. "The greatest wonder of this day is that you were here to share it with me." And then she spoke sweet disaster. "I love you, Marc. I always saw things to love in you—your brilliance, your passion, your tenderness. But they weren't fully formed—you were too much the child. But now . . . now, love, you're all I saw you could be, and I can love you unreservedly.

"Oh, Marc, I longed for this. That's why I let you join me out here. It's so hard sometimes, being hunted, being hated. I needed someone who could love me, who could join with me out here, match my passion for the work, and give me the strength to fight on. And I knew you were the one, my golden love," she gasped, stroking his blond hair. Then her lips stopped speaking and began exploring him, probing his every contour with a scientist's attention to detail. Marc sobbed his lifelong love for Safira while silently wishing he'd never been born.

* * *

The lake shimmered like satin. Seeking the cause of the odd metallic sparkle, Safira had sampled the water and found it teeming with extraction nanites, the kind used to mine seawater for its dissolute material wealth. "But how?" Marc had frowned, gazing over her shoulder at the magnified image. "Those nanites weren't designed to operate independently of the submarine auxons, were they?"

Safira shook her head. "And they certainly weren't made to evolve. They're too small, too simple to have adaptive replication. They could only mutate through random error, so any meaningful evolution would take millennia."

Luckily, the loggers had camped in the adjacent forest, enabling the humans to make their own camp by the lake. It took most of the day to solve the puzzle. The nanites, it turned out, were not autonomous. A breed of submarine auxons descended from aquatic probes inhabited the lake. These cyberfish manufactured the nanites within their bodies and released them into the water, where they gathered dissolved elements and were then reabsorbed by their host species. "Amazing," Safira beamed once this became clear. "It's like termites' symbiosis with their digestive bacteria—only outside the body."

"Somewhat too efficient, though," Marc frowned. "They've extracted so much material that the lake can barely support organic life."

"But the cyber-ecology's in good balance," Safira replied. "Plenty of piscivorous heliraptors around; and I saw the ripple of a cybarracuda on the prowl."

"But what about the *real* ecology? The lake's natural ecosystem's been all but exterminated. Who knows how many species lived in that lake before? Or how many other species fed on them, or were fertilized by organic remains flowing out of the lake?"

Safira frowned. "Now you sound like the government. Like the hunters."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

He took a breath. He had to do this delicately. If she realized too much she would bolt and make things harder. "When I see things like this, Safi, I wonder if they have a point. I mean, look at all the wonders we've seen the past few days. The unique forms that life—biological life—has taken on this world. How many species have the auxons already competed to extinction?"

"No species lasts forever, Marc. Extinctions are only to be expected when different branches of life come into contact."

"But the auxons' Lamarckian evolution lets them develop faster than organic life can keep up. And they have abilities no biological species has ever possessed. They've got an unfair advantage in the competition. I mean . . . I just, I can see the government's point. This is such a young biosphere, with so much untapped potential. Those gliding fan-dancers—with the auxons around, do you really believe they'll have the *chance* to evolve actual flight? Is it . . . " He pulled back, softened his approach. "Sometimes I do have doubts whether it's really right to, to allow all the extinctions the auxons have caused."

Safira stroked his hair, her face wistful. "Oh, Marc. Remember that time in Sumatra? You were so hurt when that baby orangutan was taken by a tiger . . . especially knowing that we had bred the tigers as well as the orangs. You felt so responsible. But do you remember what I told you?"

He nodded, and spoke with lowered eyes. "That our responsibility ends with correcting the damage we caused in the past, and avoiding further damage."

"That's right. Nature doesn't belong to us, Marc. No, it's not ours to exploit and destroy, but neither is it ours to nursemaid and cultivate like a garden. Nature is larger than we are, and can take care of itself without our arrogant meddling." She wasn't so much lecturing him, Marc realized, as reflexively restating a long-practiced argument.

"But we sent the auxons here. Gave them the ability to evolve."

"And designed them to cause minimal ecological damage. But then they were threatened, and had to breed and defend themselves to survive. When our programming conflicted with those imperatives, they discarded it as maladaptive genes are always discarded. When they came into competition with native species, they did so not because of humanity's will, but *in spite* of it. They've evolved beyond our jurisdiction!" she insisted.

"But we made them strong, durable, adaptable," Marc countered. "Made them able to function without food or water or air. Gave them tools more potent than any tooth or claw. Let them build defenses so strong nothing natural could break through them. Safira, they're competing because of evolution—but they're *winning* because of us. Doesn't that make us responsible?"

"So what do we do? Consciously exterminate a whole, unique category of life? Correct an accidental evil by committing a deliberate evil? How does that moral equation balance?" She shook her head sadly. "Yes, I regret the loss of the native life. You know I cried as hard as you about that baby orang. But I didn't try to kill the tiger who was simply following her instincts. Whatever responsibility I bore for her existence did *not* entitle me to end it!"

Marc was reluctant to continue, but he felt he must. "But if the whole biosphere is in danger of extermination—"

"Absurd!" she snapped. Then she sighed, breathed deeply and hugged him. "I'm sorry, love, it's not you I'm angry at. But you can't really take that claim seriously. Those fools, they claim to be defending the native life, but they have no faith in it. They've forgotten that life manages to survive in the harshest conditions, no matter what the universe throws at it. Cybele's life will adapt, will find new ways to thrive. There may very well be a mass extinc-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

tion event, but such things are normal on any world, and a new evolutionary phase always follows. And who can imagine what that next phase might hold for a world where bio-life and cyber-life coexist? Marc, we have no right to narrow the possibilities. And bottom line, no matter the cost," she added with passion, "we have *no* right to deliberately exterminate any species, period!"

Marc sat quietly for a time, not wanting to argue further, not knowing how. "A lot of people out there don't agree," he finally said. "You . . . we've got most of Cybele's population against us. I don't see how we can win. I just . . . don't want you to get hurt."

Safira smiled wistfully. "Marc, my dear one. If I pulled back from a just fight because I feared getting hurt, could you love me as you do?"

It was painful to meet her eyes. "No," he breathed with utter sincerity. She would fight on until she was broken, and he adored her for it . . . but still he knew he had to bring her down.

The lake's heliraptors proved too numerous and hostile for the loggers' comfort, so the troop moved on. Two of Cybele's 32-hour days passed before they came upon the majestic sight of a city-hive. It gleamed like a fairy-castle of diamond and quartz, bearing the clean-lined polish of late-21st-century architecture, but with the comfortable asymmetry of an organic structure. The feral city-builder auxons still followed their innate construction protocols, but had adapted to the survival needs of wild creatures as opposed to the creature comforts of civilized humans.

The town-sized hive bore few doors, and those were auxon-sized openings obscured within the maze of towers, roadways and nonfunctional streetlights. The city was walled with high diamite ramparts, with only hidden tunnels allowing ingress. The once-fashionable colorshift dyes followed no aesthetic rules, functioning merely to regulate temperature or absorb solar energy, changing to follow the sun across the deep indigo sky; yet that simple functionality gave them a special beauty.

And the whole magnificent structure was thoroughly dead. From an adjacent hill, Safira and Marc could see that the hive's streets were littered with city-builder corpses. "EMP bombs," Safira said with soft, tearful fury. "The hives are easy, sitting targets. Fish in a barrel. No-fuss genocide. *Cowards!*" She allowed herself the skyward shriek, then indulged her rage no further, instead coolly deploying a camera to record the atrocity. The *necessary* atrocity, Marc reminded himself.

The loggers seemed subdued at the mass carnage, but they were a pragmatic lot. They soon found an entrance and filed inside, unhesitant to exploit a ready-made redoubt. The casual way they gathered corpses for consumption made Marc queasy, but Safira narrated it as a hopeful thing, the beginning of the city-builders' rebirth as a large new generation of loggers. "Imagine what evolutionary variants might arise as loggers absorb builders' experiences and adaptations," she said into her recorder. "A whole new species could soon be born from Galadriel's womb."

This time Marc heard the engines first. *Sorry, Safira,* he thought with sad relief, recognizing aircars as well as drones. *Galadriel will have no more children.*

The loggers were the next to react, their agitation alerting Safira. "Shit, not again!" she snarled, leaping for her pack and the plasma rifles.

"Safira!" Marc protested. "Those aren't just drones. There are people coming."

She looked up and out, recognizing the silhouettes of a small fleet of police aircars. Her grimace of despair was gone almost before Marc saw it. "Come on. Under cover. Come on!" she called to the loggers, adding gestures and whis-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

tles. Galadriel joined her in corralling the troop, and collectively they took cover beneath a large plaza which sloped between two buildings. A place like this, cut off from the sky, defied the standards of this architectural period, but the mutant city planning now served the loggers well. Of course, another EMP bomb would have finished them; but the collateral radiation precluded the bombs' use while Safira and Marc were present.

"Galadriel!" Safira called, gesturing curtly toward one end of the underpass. Shortly, the loggers began erecting a barricade from city-builder corpses and plasticrystal secretions. "This leaves the drones only one way in," Safira explained, "so we can pick them off more easily."

"What's the point?" Marc urged. "They've surrounded the whole hive by now. And *we* can't eat the builders. It's over, Safira. There's no way out."

"We'll find one. Tunnel out if we have to."

Marc shook his head. "They can track us wherever we go."

"What makes you so sure?" she taunted with an encouraging smile.

The smile vanished in an eyeblink when her wristcom spoke to her. "Take his word for it, Dr. Kimenye," it said in a heavy but not unkind male voice. "You're broadcasting loud and clear."

Safira gaped at the instrument. "Governor Berdahl?"

"A pleasure to speak to you again, Safira," said *Anansi*'s former captain. "I only regret the circumstances. Please surrender quietly, old friend. You can't evade us now, even if you abandon your wristcom. And then you couldn't take your notes, or stir the public to your cause."

"There would be other ways."

"And I'm sure you'd find them. You're as resourceful as they come. But your current resources can't bring you escape," Berdahl said in a tone of simple reason. "They can only delay the inevitable."

"I'm not the only one out here, protecting the auxons," Safira countered defiantly.

"But you're the inspiration. The cause would wither without your strength, your passion. Besides—we infiltrated your support network weeks ago. We've shut them down. Those other few dedicated naturalists scattered around Cybele, protecting other auxons—soon they'll have no choice but to come in from the cold."

A pause. "I don't believe you."

"Then how do you suppose we're talking now? How else could we have gotten a hard virus into your wristcom to reactivate its transceiver?"

"Impossible. The supplies are scanned for nanites." Yet Safira had already begun tapping commands into her wristcom before she spoke.

"Nanites, yes. But you've shown us that the lines can be blurred—that machines can behave like living things. We simply turned that around. We engineered an organic 'hard virus.' Actually more of a bacterium—a native protozoan to which we gave an affinity for certain trace elements in certain ratios, elements such as those you'd find in a wristcom's circuitry; and to feed on those elements and lay down waste products along certain specific paths . . . like those which, for instance, would reconnect severed transceiver circuits."

"Richard, that's a rather implausible story," she scoffed, still tapping out commands. Marc suspected this was more than denial, was perhaps some sort of delaying tactic. Her next words, though, left no more room for that thought. "The only person on Cybele with the necessary expertise for that is right here by my side—*on* my side. Isn't that right, Marc?"

His silence was confession enough, even without the guilt he knew he must be radiating. Finally the silence grew too long, and he had to look up. Her gaze seared him.

He struggled to think of something to

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

say. He'd been too afraid of this moment to plan for it. "You, you have to understand, Safira. I didn't do this to hurt you. I admire and respect and . . . and truly love you.

"Which is why it hurt me so much to see you out here helping to perpetuate the crime against nature our forebears committed. To see you blinded to the devastation, and to our own culpability for it."

She merely looked at him stonily. "Yes," Marc continued, "I've seen how remarkable the auxons are. But they're just *too* strong, too capable for organic life to compete with. They're killing Cybele, and I can't stand by and watch that happen.

"The thought of betraying you to do it . . . Safi, it devastated me. But . . . you yourself taught me that you have to do what has to be done, no matter how hard or painful. I . . . I had to remain true to what I believed in."

No reply. No fury, no tears. She was a sculpture of icy dignity. "Safira, I never expected that . . . that we'd fall in love. I tried not to let it happen, I *knew* it'd hurt you so much worse. But . . . but then it happened anyway. And I just couldn't tell you, I didn't know how. I . . . " He floundered. At least if she'd railed and screamed, he could have stood up to it, justified himself with righteous anger. But she remained silent, so that the more he strove to explain, the clearer it became that he was really trying to convince himself. She was so bitter that she gave him nothing, not the dignity of self-defense, not even the right to see her pain.

"I had to do this," he finished weakly. "It was bigger than you or me. I'm sorry, but it had to be done."

The long silence that followed was finally broken by Berdahl's voice. "Safira . . . don't be too hard on Marc. Nobody here feels good about what's happened, the way colleagues and friends have been pitted against each other.

"But we don't blame you for that, Safira. Your fascination with the auxons is perfectly understandable. They are an amazing phenomenon, and it would be a shame if they were destroyed completely. Rest assured, some specimens of each species *will* be preserved, relocated to Attis, where they can—"

"Where they may not survive," she said flatly. "They've spent over a century adapting to this world, a living world. Uproot them to such a barren planet and they might not be able to adapt. Many of them, maybe most, would indeed go extinct."

"I thought you had more faith in their adaptability."

"Even cybernetic evolution has its limits. And even if they did survive, it's still wrong," she insisted. "If it's wrong to kill a hundred percent of a species, then how can it be right to kill ninety-nine percent of them? Or ninety? Or fifty? Or even one animal that doesn't threaten you and you don't need to eat? Where can you draw the line, Governor?"

"The line was crossed the moment the first Cybeline species was driven to extinction by our creations," Berdahl responded with conviction.

"We designed them *not* to harm native life. They evolved away from that on their own."

"Conveniently letting us wash our hands of all responsibility? No, Safira. However they behave, auxons are human technology. This is our mess and we have to clean it up."

"*Not this way.* You cannot be allowed to sentence whole species to death." She smiled faintly at something on her wristcom display.

"As we see it, Safira, that's what you're doing. And *you* can't be allowed to continue. I'm—" Suddenly he broke off. Marc heard another voice speaking urgently in the background. "Safira, what have you done?"

"You reactivated my transceiver, I used it. The past few minutes have been beamed out all over CybeleNet." Somehow, the discovery that Marc's betrayal

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

had been exposed to all of Cybele brought him no more shame than he already felt. "As your monitors will have read by now, my supporters are coming. You've arrested my volunteers, but the people who believe in what we're doing are still out there. They will no longer stand by while you commit these crimes."

"That's it," Berdahl said angrily, "move in now!"

"Not advisable, Governor! I'm armed!"

"I'm not sending in drones, Doctor, but live people. We can stun you and take out the loggers without ever getting in a stun pistol's range."

"How about a plasma rifle?"

A moment of shock. "You wouldn't kill humans to save the auxons!"

"I will do what I must to stop a horrible crime!" she said with sorrow.

"And the people who are coming to stand with you? Will they be armed too? Are your convictions so unshakable that you'd allow this to escalate into open warfare? My God, there are only three hundred adult humans on this planet! The whole settlement could be at risk!"

"Don't you think I realize that?! Do you think I'd do this, any of this, if I had a choice? Just *turn around,* Richard. Don't force this on me."

"Every day the auxons live kills another species. We *will* not do to Cybele what we did to Earth!"

"Put it down, Safira."

Marc's voice lacked the conviction appropriate to the threat . . . but the stun-gun in his grip compensated. Safira whirled on him, her eyes lit with fury, and for a moment he feared her hatred would translate into plasma flame. "It's over," he urged when the moment passed. "You can't win."

"Neither can you," she hissed. "Can you be sure I won't convulse and fire if you stun me? Can you be sure the loggers won't avenge a fallen troopmate?"

"As long as you're safe . . . as long as you're stopped from this madness . . . I'll risk it."

"The madness is yours! I'm defending innocents against murderers. I can't shirk that duty." Her eyes gleamed with something other than rage. "Even now, Marc, even with all the hate I have for you . . . the thought of killing you shreds me inside. But I no longer have any choices."

She laughed bitterly. "I suppose this is why we shouldn't take sides in nature. There's no right or wrong out here; there's just *need*. When two animals, two species fight to the death, they're both driven by the same needs, the same forces. Morality and choice don't come into it—only blind necessity."

She laughed, though it was half a sob. "The hell of it is, I *know* you can't back down any more than I can. We're both fighting for the same causes, just interpreted differently. We're both doing what we have to do . . . and so we have no damned choice at all."

Their guns and eyes remained fixed, unwavering, upon each other. The moment stretched like steel wire toward its breaking point. But then Marc shook his head, lowered his weapon. "No," he breathed. "No, Safira. We're reasoning beings, not slaves to instinct. Even when the circumstances go beyond our control, we still *choose* how we react to them. Saying we're prisoners of the situation is just a cop-out.

"If this turns bloody, it will be *our* choice, *our* fault. It's not inevitable. We can all just back down. Go home. Talk this over, find another way."

"There is no other way," came Berdahl's voice. "Species are dying too fast."

"We have to leave nature to itself!" came Safira's words on his heels.

"You're right—you're *both* right in what you're fighting for. But you're fighting too hard. Too inflexibly. Life survives by adapting! By making compromises with its environment! We have to compromise too—have to bend before we break."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"What do you propose?" Safira was businesslike, suspicious.

"Um . . . give me a moment." He thought faster than ever before. "Okay. Extinctions happen, all right? They're part of nature, the result of competition, of changing conditions. So maintaining a perfect status quo, keeping the roster of species unchanged, isn't a realistic objective.

"The main concern here is that the whole biosphere may be endangered. Safira, you're probably right that some life would remain untroubled by the auxons, but there might be nothing left but microbes. And the nanites might take care of those eventually.

"Anyway, the point is: instead of erasing the auxons from the biosphere, let's just make sure they don't wipe it out. Let's allow them to live, to compete. If they should compete another species to extinction, *c'est la guerre.* We only intervene if a whole ecosystem is threatened with collapse. That way the auxons and Cybelines can both live."

"It won't work!" Berdahl countered, but with honest regret. "The auxons are too adaptable, too capable, their defenses too strong. They've won *every* competition with the native life. The fix is in, Marc."

"So we even the odds. This is where you have to compromise, Safira. To save the auxons' lives, you bend some on their untouchability. We used a hard virus on your wristcom, we can use it on them. Reprogram their instincts, restrict their behaviors. Not enough to make them our robots again . . . but enough to limit the destruction they can cause. Enough to diminish their performance, weaken their defenses. Maybe even cut out their Lamarckian adaptation so both sides are playing by Darwin's rules."

Safira was thoughtful, but far from pleased. "But do we have the right?"

"Why not? We're part of nature too. That means we can't pretend it belongs to us—but it also means we have as much right as any species to have an effect on our environment."

"But only where our own survival is concerned."

"There's more to us than survival, Safira! We have the power of choice. The effect we have on other species isn't a random matter, it's something we *decide*. Something we're *responsible* for. So if we take responsibility for the world and the species around us, it's not so wrong. We just have to be responsible *enough* to interfere only when we have to, and otherwise trust nature to manage itself."

Again, the silence stretched, but without the earlier tension. "Not an easy balance to maintain," the governor opined. "But worth a try, isn't it, Safira?"

Long moments of thought. "I still don't like it."

"Nobody will," Berdahl said. "It means letting native species die out *and* restricting the auxons' right to live according to their nature. It stinks coming and going. But would you rather start shooting?"

She gave way without weakening. "Promise there will be no more exterminations. Melt down the hunter drones. Release my colleagues and work with them to implement the plan. I will remain out here with my charges until I know they're safe."

"Agreed. I'm calling the retreat even now." A sad smile underlay his next words. "I hope it's not too long before I can have you over for dinner again. I've missed our talks. Good luck, Safira."

And then Safira and Marc were alone with the loggers once more. But Marc realized he was more alone than any of them. "Safira . . . ."

"Thank you," she said simply, distantly. "You've prevented a tragedy. Cybele owes you a debt. Now go the hell away."

He took a breath—then let his lungs keep it. He had no more defense. "You did what you had to," she continued, too matter-of-factly to be absolving. "No matter the cost. I taught you that. You learned it well. And when the time

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

came, you unlearned it before it ruined us all. You backed down and found a compromise Cybele can live with.

"But you're *too* good at compromise, Marc. You couldn't choose between your feelings for me and your mission to betray me, so you tried to have both. You dodged the hard choice—and now who has to pay for it?"

"Both of us, Safira," Marc said simply. "Believe me."

"Maybe. But we both have only you to blame. You'll have to live with yourself—but fortunately I won't. I can't speak to the future, Marc . . . but for now, you no longer exist in my life."

Head lowered in total agreement, Marc slowly rose and strode toward the sunlight. He gave her one last glance. "I guess we all do what we have to do."

She never acknowledged him. She was alone with the loggers now. ■

IT'S THE THOUGHT THAT COUNTS continued from page 77

There were still two boxes.

Knara opened one and presented another gift. Flat sheets of something . . . .

"Vegetable writing surfaces. Somewhat antiquated technologically, but esthetically pleasing and culturally significant. Also good for 'thank you' notes."

"Ah, um, yes," said Blackmore.

"We'll treasure every sheet," said Nalaway, a bit more sincerely.

"And finally," said Fnork, "A somewhat risky selection, but we remembered your admonition that it is the thought that counts. We have analyzed your biochemistry and prepared an edible gift composed of many of our planet's fruits and nuts bound in a starchy substrate. We hope you find it palatable."

"Fruitcake," Blackmore groaned.

"No Christmas is complete without it," Nalaway said. "And now let us show you what we gave you." She took the packages she and Blackmore had placed under the tree earlier in the day and handed them to the aliens, who oohed and aahed in delight at the hand-held multiphase faster-than-light transmitter and receiver, the book reader with all seventeen volumes of *The Way Things Work* stored in permanent memory, and the holographic camera and projector.

Blackmore scowled. What had happened to the gemstones, or the computer, or the self-replicating robot? He'd been had! The aliens must have known they were being listened to, and staged that little conversation to jack up the stakes. He should have remembered their first question: "What's in it for us?" He should have stuck to more conventional trading practices.

"This was a most pleasant exchange of goodies," said Bshek. "Many thanks." The alien glided further into the room, and its two companions followed closely behind.

"I sense pleasant tonal variations emanating from spots in the wall," Fnork said, waving its tentacle sinuously overhead in time with the music. Knara and Bshek joined in and they touched tentacles, intertwined them, and glided around one another in a complicated maneuver that could only be dancing.

They were pretty good at it. Blackmore watched them cavort, wondering what else he had misjudged about them.

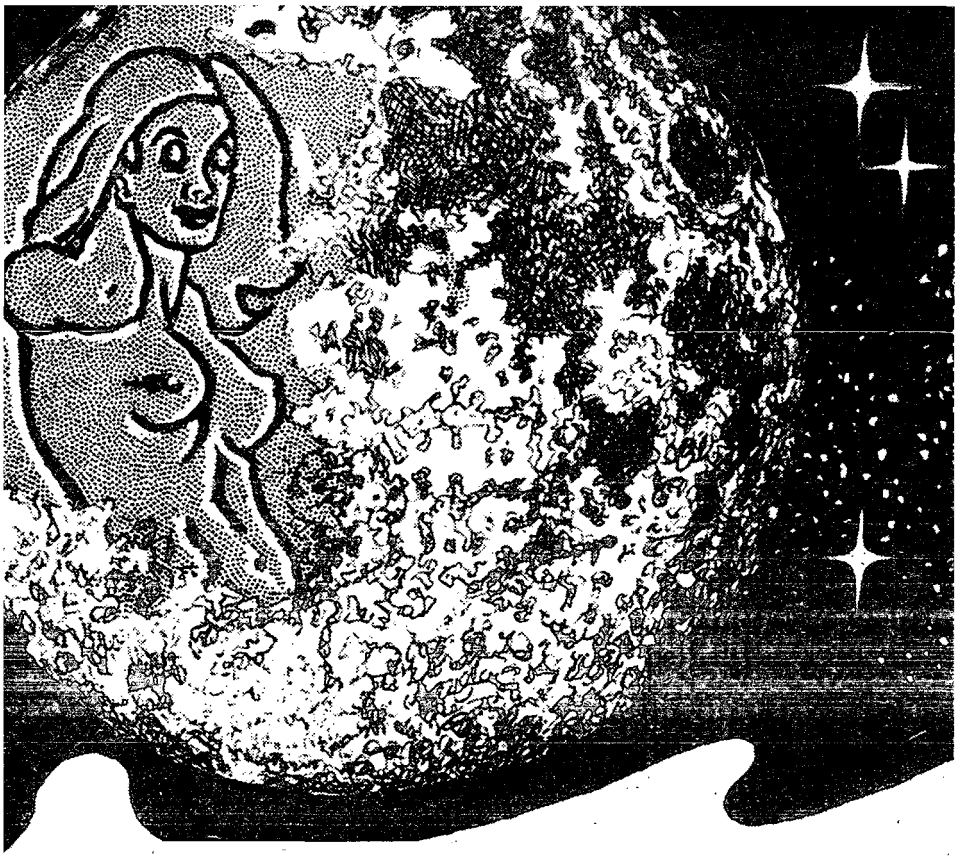
He found out when it was time for dinner. Their food smelled wonderful, but when they opened the containers he saw writhing worms, quivering green goo, and small rodentlike creatures to be eaten live.

"Mmmm, pregnant spnath!" Bshek said enthusiastically, lifting one up by its tentacle. It squealed as the alien slurped it down, and continued to squeal for a moment inside Bshek's hollow chest cavity before it gurgled to silence. Bshek licked the ends of its manipulating tentacles. "Want one?"

"Er, no thanks," said Blackmore.

"More for us!" said Fnork, who fell to with vigor. "Mmmm, I love Christmas," the alien said between squealing bites. "Let's do this every year!" ■

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED



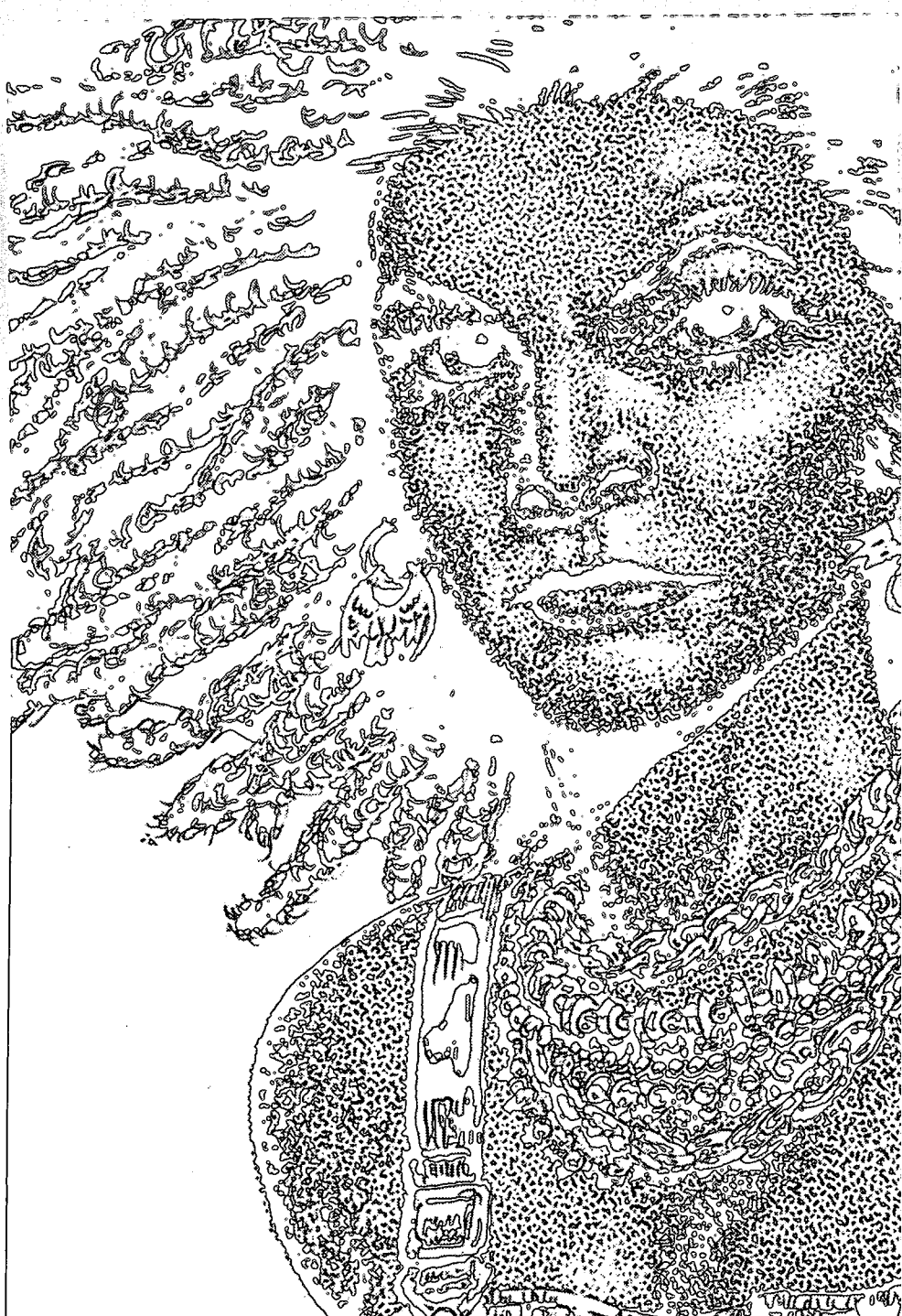
Technology lets you do things bigger and better. . . .

Eden Tag

Stephen L. Burns

Illustration by Kelly Freas

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED



LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

I'd spent a nice chunk of my afternoon locked away in my modest VirtYou, blissfully casting flies for trout in a stream near Pulaski. Now duty called, and wishing I was still hip-deep in cold rushing waters, I squared my rounded shoulders and tried to psych myself up for entering hostile territory—namely the holding area which was part of the Eden Down Public Safety Station.

I reminded myself that I was a cop, Down Constable John Andrews to be exact. I had a weapon at my belt and a badge on my chest. The most dangerous one of the three people I would be dealing with in there was safely behind bars.

But the one that unnerved me almost as badly as the real criminal was running loose in there, which from a legal standpoint was okay, but down on a personal level . . .

Not for the first time I sternly instructed myself that I shouldn't be afraid of my own Station aide.

As the top—and only—law officer of the Lunarite religious settlement Eden I took a deep breath, and doing my best to look coplike and capable, pushed the ceramic-coated door open and stepped inside.

My Wyatt Earp act lasted only as long as it took for me to plant a single foot inside, taking the step that landed me on wet, slippery stone. My balance was admittedly precarious at best, even after a year living in Lunar gravity. I found myself launched into a bit of spastic—and cartoonish—high-speed modern dance as I tried to keep from falling on my ass.

Before I could go over, one of my windmilling arms brushed into something. I grabbed on reflexively, a new set of alarm bells ringing in my head as I simultaneously caught my balance and mentally processed the peculiarly pliant, giving nature of this handhold. When I turned my head I saw that the soft, oddly-shaped safety bar which had saved me was the rather large breast of my Station Aide, the tremendous and formidable Ms. Gennie Oldabe.

I let go with a rush of guilty horror, the violence of my reaction sufficient to send me into another flailing slo-mo pratfall worthy of an old Warner Brothers cartoon.

Ms. Oldabe clamped a large pink-palmed hand around my shoulder and hoisted me clean off the floor. She brought me around to dangle before her, and squinted at me with a certain bemused menace on her round face.

I'm a guy of average height, skinny and bird-boned. Even with a certain slight middle-zone density brought on by middle age, I'm still more Tinkertoys and rubberbands than meat and muscle. The sad fact is that when people see me without my uniform and badge they think *bookworm*, and when they see me with them, they assume I'm on my way to a costume party. While I can pump info with the best of them, lifting anything heavier than a box of datahards is largely beyond me.

The woman who held me in her grip was constructed to an entirely different specification. Like so many born in America, I tend to revert to non-metric when assessing the size of people. Ms. Oldabe had to be within a hair of seven feet tall, and while big enough to tip Earthly scales somewhere in the area of two hundred and fifty odd pounds, she wasn't fat; she was all big bones and curvaceous female solidity. Her skin was the color of dark chocolate, her hair a wild mane of luminescent purple dreadlocks, and her makeup applied by a hand obviously not guided by the normal dictates of fashion. Around her neck was draped several pounds of junk jewelry, pinned to her left earlobe was a red plastic devil, to her right a headless white plastic angel.

The breast which had saved me from falling—and its equally impressive sister—were held more or less in control by a pair of baggy silver bib overalls. This was a rather subdued choice in

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

clothing compared to some of her previous outfits. Her feet were bare, her toes adorned with an assortment of rings, her toenails painted with the same shifting-hued rainbow paint as her fingernails. In the drab gray environs of the holding area she stood out as vivid and eye-catching as a circus wagon, and she smelled like a peculiar combination of roses and beer.

"You just messed up my nice clean floor, Sheriff," she informed me in a low, throaty voice. Her accent was hard to place; it seemed to change with her moods. She had begun working for me two weeks before, and begun calling me Sheriff on day one. I had given up correcting her about day three.

"Sorry," I said, surely sounding like I meant it.

"Grappled me by the tit, too." She patted the offended body part as if to calm it.

"It was an accident," I answered with heartfelt repentance. From my new higher vantage point I could see down the front of those biballs. If I'd dared. I focused on her face hard enough to make my eyeballs hurt. "Really."

She considered this plea. "Well, I should *hope* so." A toss of her head. "I'm a lady, you know!"

"I know, Ms. Oldabe." I tried for a winning smile, no doubt looking like a man experiencing technical difficulties with his zipper. "A very nice lady. Gentle and forgiving."

"Just because I work for you don't mean I have to stand for such monkey business. There are laws."

"No ma'am, you don't. I apologize." I did my best to draw myself up and look dignified—not an easy task when your feet are dangling a good two feet off the floor. "I would never make such crude or untoward advances."

I hoped I looked like I was telling the truth, the whole truth, and nothing but the truth. First because she could probably pry off my arms and legs as easily as I'd torn the wings and drumsticks off the Cornish Game Hen I'd had for supper the night before. Second because the last thing I wanted her to know was that making such advances *had* crossed my mind several times.

I confess. All my life big women have provoked two conflicting reactions inside me; a shy sort of terror, and a peculiar awestruck shyly terrified lust. Ms. Gennie Oldabe inspired both in amounts proportional to her size.

"Aw," she sighed, "You men are all alike." She said this as if passing sentence on my entire gender.

"If you say so, Ms. Oldabe," I agreed meekly.

"I do." She lowered me back to the floor. "Now you go about your business, Sheriff, and no more attacking poor defenseless girls. Right?"

"Certainly."

"And mind my nice clean floor."

I felt far safer once I let myself into Timothy Waugh's cell. The kid looked up from his slayte, pushed a shock of silver-foiled hair out of eyes heavily mascaraed with Pixel Dust and smiled. Then he caught himself and worked his thin face into a proper mask of adolescent indifference. Small for fifteen, his scrawny body seemed lost inside a baggy marqueetee that came down to knobby knees lost in vast white vinyl pants. When you're that age nothing fits right; not your clothes or your life.

"'Lo John, how're you doing?" he mumbled, not quite able to keep his pleasure at having a visitor out of his voice. In spite of a year of arrests and gentle threats, we were friends.

"I'm managing, Tim." I gestured at the slayte. "What sort of evil, antisocial shit are you up to now, kid?"

Tim's grin returned for a moment, then faded into an expression of woe. "I'm not antisocial. I just can't—I mean sometimes this place just . . ." His voice trailed away and he shrugged.

"I know, son." Now I had to deliver the bad news. "I tried talking to the El-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ders one more time. They still want to deport you."

"Thanks for trying, anyway," the boy sighed, slumping into hunched misery. I sat down beside him on the bunk, wishing there was something else I could do. Of all the people on Eden, I probably came closer to understanding the urges and impulses which had gotten the boy into trouble than anyone else. Not that I'd been all that wild as a Moe-cut fifteen-year-old edgeBoy, understanding hardware and software and ear-damaging music far better than I grasped the big frightening world of girls, and the moboring world of adults. The stuff Tim had pulled would've been written off as clever but essentially harmless teenage hijinks almost anywhere else but Eden.

But this *was* Eden, and it operated by its own special rules and expectations. Rules he broke, and expectations he failed to meet. The boy was the proverbial square peg trying to be forced into a round hole. One of a particularly narrow gauge.

MOON—the Moon Oversight Operations Network—owns, operates, and oversees all facets of normal Lunar settlement. They created the big settlements at Ambrosia Down and its sister colonies. But MOON operates under UN charter, and in its finite wisdom that august body had passed RFCA, the Religious Freedom Colonization Act. RFCA had in turn forced MOON to permit the construction of a few smaller autonomous colonies such as MohammaDown, the small enclave built and maintained by a group of Sufis; High Lhaso, the home in exile of the 16th Dalai Lama; AstraRoma, the off-Earth Jesuit retreat; and of course Eden.

Eden Down was the work of a sect called the Lunarites, a demiradical offshoot of the Mennonites. Just as the Mennonites were—at least to the eyes of outsiders—sort of high-tech Amish, Lunarites were an sect whose goal it was to praise God by farming on the Moon. They were good people. Honest, hard-working, fairly tolerant, and joyful in their way. Just as Mennonites accept a level of technology the Amish would find abhorrent, the Lunarites were willing to accept the various kinds of tech which made surviving on the Moon possible.

But they could not quite bring themselves to accept this mutant child of one of their own; a budding cyZer and Fractal Metal lover with a taste for graffiti, pranks, and stylistic expression completely at loggerheads with the fairly conservative Lunarite credo. His parents, Jebadiah and Martha Waugh, had threatened to disown the boy when, after a long list of previous transgressions, a sly reprogramming of the farming tunnels' environmental system had turned one particular Women's Harvest Meeting into a sort of wet tee-shirt contest. Actually, the women laughed that one off, but the men, the Elders in particular, were not amused.

By then he'd also gotten into graffiti. It began with odd phrases and images gleaned from a hundred years of rock-and-roll poetry being tagged in oddly apt places inside the Down. Shortly afterward these words and phrases began appearing in the sea of dust surrounding Eden. His latest infraction had been somehow managing to create a multi-square-kilometer work of graffiti, and to my mind it had been a masterpiece. The boy had somehow created an upper torso nude rendering of softporn star Filomena Soon featuring Eden's dome as her left nipple. An image large enough to be seen from space, and interesting enough to have made the global newscasts. Soon had even offered to come to Eden and perform. As far as his parents and the Elders were concerned, that was the last straw. I had to arrest him and hold him for deportation.

"Look," I said, "I know some people in Tycho. Maybe I could get them to swing an internship."

"You want me to become a paper-pushing cop like—" the boy caught him-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

self, looked guilty.

"Like me?" I supplied in a gentle tone. It took a misfit to know a misfit. Somehow, some UN Peacekeeper personnel manager—no doubt one recovering from a recent head injury—had decided that a certain Sergeant John Andrews, twenty-year veteran of its Ames, Iowa Data Management Center, was the perfect candidate to become the active lawman assigned to Eden. I was run through a two-week 'refresher' course in law-enforcement theory, technique, and tactics before being shipped to the Moon a bit over a year ago, this course supposedly refreshing material I had not really absorbed the first time around since I'd known from the first that my beat was going to be a desk and terminal. On Earth.

"Sorry, John. I didn't mean it like that."

I patted the boy's shoulder. "It's OK, kid. I doubt either of us belong here, but I think it's wrong to make you leave." I stood up. "The UNP detail coming to pick up the other prisoner and escort you back to Tycho is due on the regular shuttle at 1900 hours, departure at 0700. Let me know if you change your mind. OK?"

Tim nodded glumly. "Sure."

"Now I've got to go check on my other prisoner. You yell if you need anything."

The boy looked up, real concern on his face. "You be real careful around that mac, John. OK?"

I pushed the unlocked cell door open. "Count on it."

Only the fact that crime is nearly nonexistent in Eden permits a law officer with my lack of authority and ability do a passably creditable job. Lunarites are about as peaceful and law-abiding a group of people you will find anywhere; their religion puts stronger restraints on their behavior than the law. Still, they are people, and I did have to play cop sometimes.

I'd sorted out the mess after a couple of fights, one between two young men over a young lady, the other happening when one man thought another man was paying too-close attention to his wife. I've taken Old Man Ploog into protective custody those times when he's gone overboard with his homebrewed wine, and put the brakes on a few teenage experiments with Ploog's Brew. Mediated a couple domestic events and the random argument. The first real crime I had to deal with—other than Tim's antics—had come to my attention about a month before.

Matthew and Leah Hinman, the young couple who handled communication and mail for Eden, had called me in to tell me they suspected that someone was stealing bandwidth. MOON gives nothing away, and other than the biweekly shuttle, the down's only communication with the outside world was conducted via a satellite the Network owns. Nor was it a simple case of leased use; Eden was billed by the gig for uplink and down—and no paltry sum, either. For the past couple months there had been charges for a whole lot more traffic than their scrupulously kept logs could account for passing through their system.

While your average beat cop might have found this sort of obscure technotheft harder to run down than a fleeing marathoner in a new pair of Jet-Sneeks, it was right up my alley. The thief had been clever, employing a series of black-market system-level siphonettes to create his own personal free pipeline. The Hinmans couldn't have found and cracked them if their lives depended on it. But brushing off some somewhat rusty skills acquired as a kid of Tim's age, and applying the dogged determination of a born bean-sorter let me finally trace the theft to one Jude Talley.

It was at that point things got complicated. Talley was virting, which your average Lunarite was about as likely to do as nude mud wrestling, and going places

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

only accessible by the shifting web of nodes and trapdoors maintained by the criminal underground. This of course led me to the brilliant deduction that Talley wasn't who or what he said he was.

An urban law officer would've had access to several exotic methods of getting an ID on the sly. I just happened to pass through a farm tunnel where Talley was working, and trading on my well-known gracelessness in Lunar gravity, tripped and knocked the man's hat off. When I handed it back it was with profuse apologies and minus a couple hastily filched hair samples.

One DNA scan later I had a *big* problem on my hands. The man calling himself Jude Talley was really Epson Detweiler III, head of the Stern Fathers, a male-supremacist terrorist group which had made unsuccessful attempts on the lives of several female world leaders, killing several people in the process. He was being sought by the UN Peacekeepers and more than a dozen Earth-based police agencies, and I had him here on Eden.

Detweiler was in the furthest, most secure cell. I found him sitting on his bunk, working away at some misogynistic manifesto or other on a slayte which I'd crippled to work as a recording device only. Just once I'd made the mistake of asking the man what he was writing. That had been more than enough.

The prisoner looked up and smiled. "Good day to you, Constable."

Detweiler's smile always unnerved me. The man smiled like *I* was the one on the wrong side of the bars. It didn't help that he was also everything I'm not: tall, muscular, handsome, and reeking a macho self-assurance worthy of an action flick's hero. A spoiled child of privilege, he had a first class education and a hideous view of sexual politics. It had taken six of us to capture and subdue him—that sum made by five brawny farmers piling onto the man, and me standing to one side shouting helpful directions until they pinned the felon well enough for me to dart in and put on manacles.

"How're you doing?" I asked, not really caring. I'd kept him fed and watered for almost three weeks, the Peacekeepers for some reason unable to manage to come after him on the last shuttle and unwilling to make a special trip. I just wanted him gone. He belonged in some maximum security facility, not my jail, and I was weary and wrung out from being forced to keep a mad dog in a pen designed to hold puppies.

"Well enough, considering the injustice of my incarceration. Is there still an escort coming to remove me from your custody?"

"Yeah. You'll spend the night here in lockup, then in the morning you'll be taken aboard the *McDevitt* for the trip to Tycho. From there you'll be transferred—"

"*Come on, Sheriff! Move your goddamned feet!*"

I lurched aside in surprise, crashing into the cell bars. I had been so concentrating on dealing with the prisoner that I hadn't heard Gennie Oldabe bearing down on me with a mop and bucket, apparently having decided that she had to clean the very spot I was standing.

"Could you wait just one minute?" I said crossly, stepping back from the bars and rubbing my bruised shoulder.

Detweiler spoke up before she could answer. "Ah," he said with a smug smile. "Our beloved charwoman, and one of the brighter spots in my incarceration. It is *so* heartening to see a sperm sump who knows her place. Though I do think you could scrub better on your knees, and that posture would more befit your position in a proper society." Sperm sump was one of the kinder phrases he used to describe women.

Ms. Oldabe eyed the terrorist like a recalcitrant dark stain in a toilet bowl and gave the mop handle a warning waggle. "Only a damn fool would smart-mouth a

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

woman my size armed with a big stick."

The smile became a smirk. "Why don't you come in here, my dusky giant uterus-equipped defective? You show me your big stick and I'll show you mine. We'll see who is better equipped."

Ms. Oldabe bared her teeth. "Don't make me *laugh*," she hooted, her voice dripping scorn. "I already seen that pitiful little worm you call a trouser snake. It might come in handy if I was going fishin' for minnows, but it ain't up to *no* kind of heavy work."

Detweiler didn't take her comments on his manhood well. He came up off the bunk and slammed into the bars. "Shut your mouth, you oversized spook bitch," he shouted, "No grubby sperm sump talks to *me* like that!"

Ms. Oldabe peered down at me. "Did he just call me *oversized*, Sheriff?"

"I, ah, think so," I said cautiously.

"Do *you* think I'm oversized?"

How the prisoner's slur had ended me up on the hotseat eluded me. "Ah, no," I began, choosing every word carefully. "I think you're, um, the perfect size for your, um, size."

"You're an overgrown tub of weak-willed *lard!*" Detweiler sneered. "You're an ugly mouthy dyke! You're Moby Dickless, the great black whale!"

"Now really," I began, feeling some obscure impulse to defend her honor, even though I felt like a mouse trying to protect a mastiff. "I don't think—"

"Are you gonna let him talk to me like that?" Ms. Oldabe demanded angrily.

"I was trying to—"

"You men are all *alike!*" She slammed down her mop bucket and stormed off. The pail hit the floor, and the dirty water it contained, after a moment's dreamy low-G consideration, sloshed up all over me. I winced when it hit, and winced again when she slammed the door to the holding area behind her hard enough to snap it off its hinges.

"*Women!*" Detweiler sneered triumphantly, going back to his bunk.

"What did *I* do?" I asked the unfeeling universe as I shambled wearily back to my office to find a dry uniform.

A few hours later, and just as I was about to go meet the *McDevitt*, a call came in. I sat back down and tabbed ACCEPT.

"Eden Police, Constable Williams."

A panicked looking Elder Eli Joyce stared up at me from the small screen. "John," he puffed, "We've got a serious problem! Could you come over to the packaging area? *Fast?*"

"Law or otherwise?"

"Otherwise! Please hurry!"

"On my way." I cut the connection, grabbed my slayte and headed off at a cautious loping run.

The Lunarites' peculiar relationship with more advanced technology sometimes caused them some problems. While their economic viability and very existence depended on a fair number of computers, the Elders steadfastly forbade the use of any imbued with even rudimentary AI. Which meant that when something went wrong with one you couldn't reason with it. Since my arrival on Eden I'd spent more time laying down the law to their cybernetic systems than their citizens. The other person who had done the bulk of this work—and had been doing so since the age of six—was Tim. Since his incarceration my extralegal workload had increased dramatically.

Please don't jump to the wrong conclusion. That wasn't the reason I'd tried so hard to get the Elders to let the kid stay. I genuinely liked the boy, and knew that no oyster produces a pearl without an irritant. I figured Tim's presence, and continual challenge to their ways, was good for them. It kept them on their toes, and reminded them that there were ways other than their own.

The problem which had made Eli call for me earned a rating of 3 out of a possible 10 on the Andrews Disaster Meter. The computer controlling the machine that packaged the fresh vegetables their

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

farm tunnels produced had gone flaky on them, trying to individually wrap smaller items like cherry tomatoes and berries, and force large produce like squash and melons into little bitty trays. The squashes were getting squashed, and the melons mushed.

The people of Eden are master farmers, able to time crop rotations so that their produce was perfectly poised for picking when the biweekly shuttle came. They would harvest all day, pack in the evening, and then early in the morning load the shuttle's cargo bay with fresh produce and poultry that went to the kitchens of restaurants and gourmets all over the Moon. Income from this trade kept the settlement solvent.

It was almost 1950 hours when I finally got things straightened out, the problem not a bug in the programming but an insect shorting out some circuitry. I knew I'd missed the shuttle's arrival, and hoped the Peacekeepers sent to take Detweiler off my hands were waiting back at the Police Station.

I hoped I wouldn't be in too much trouble for keeping them waiting.

"Sorry I'm late," I called as I breezed in the door. "Something came—"

My apology stalled there because that's when I realized that Epson Detweiler was sitting in the chair behind my desk. He looked quite comfortable, and happy to see me.

"What're you doing out?" I yelped, going for my weapon. Before my hand fell on the stunner's butt something cold and hard was jammed into a spot right behind my ear.

I froze, swallowed hard. Turned slowly around and found an extremely large and lethal looking rifle pointed at my head. It was in the hands of an equally large and lethal-looking male Peacekeeper in matte black combat armor.

"Well, well, well, Constable," Detweiler called in an amused voice. "It would seem the tables have turned."

I turned back toward the terrorist, my mind churning as I strove to solve two imperative questions: how to get out of this mess, and how to keep from peeing my pants while I thought about how bad a mess it was. "So you're, um, escaping?" I said, trying to sound like I wasn't surprised or worried.

"Yes. Eventually."

"Don't let *me* stop you." I figured it was better they left Eden in a hurry than met resistance that got people hurt. Policemen are people, too, you know.

"Don't worry, I won't," Detweiler answered with a chuckle. "But first we must attend to a little business. Come here, Constable. I require your assistance."

When I didn't start moving immediately the Peacekeeper behind me growled, "Move!" and jabbed me in the kidneys with his weapon.

I moved, and soon I was face to face the escaped prisoner across the desk. The phone was pushed toward me. "Going to let me call 911?" I joked weakly.

"No, I want you to call a few of the Elders. I need at least three of them to come here."

That didn't sound good. "Why?"

"So I can convince them to in turn convince the church leaders back on Earth to transfer all the money they have been collecting to expand this settlement into my accounts. The struggle to save mankind from the stinking swamps of female domination costs money, you know."

"You want me to call some Elders here so you can take them *hostage?* " I asked, horrified.

Detweiler shook his head. "They are already hostages. I control the shuttle, and have taken over your charming communications shack. I have two heavily armed Peacekeepers at my command, and you have one measly little stun gun. Either you ask them nicely, or I have them brought here."

I drew myself up. "Go to hell."

My former prisoner smiled and stood

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

up. Pulled a pistol from inside his jacket, then whipped me across the face with it. When I could see straight again his smile widened. "I will have that done to each and every one of them if you can't convince them to come willingly." All humor drained from his face and he pushed the barrel of the gun against my forehead. "And I will be quite displeased with you, Constable. As always, I believe my way is the better one for all concerned. Don't you agree?"

Feeling like a Judas, I whispered, "I'll call them."

"Smart move, Constable." Detweiler sat back down, keeping the gun pointed at me. "There may be hope for you yet."

"I doubt it," I sighed, then began placing calls.

Not long after I was sharing one of my own jail cells with Tim. The boy got real upset when he saw the bloody gash on my cheek. I submitted to letting him perform some toilet-paper-based first aid while filling him in on the situation, my report punctuated with the occasional *ouch!* and *yow!*

When Tim was done doctoring me he grabbed his slayte and started checking to see if Detweiler and his thugs had really taken over Eden's communication systems. I slumped back against the wall and watched, bleakly assessing our prospects. No place is perfectly equipped to deal with armed terrorists. Eden was worse equipped than most.

Finally Tim sighed and shook his head.

"No luck?" I knew that if Tim couldn't find a connection no one could.

"They shut the system right down." He turned his slayte around for me to see. Against a black screen read NETWORK FAILURE, NO ACCESS AVAILABLE AT THIS TIME. TRY LATER. "Must've pulled the plug right at the source."

"I guess we're screwed," I sighed, slumping back.

"There must be *something* we can do."

The kid sounded scared. I made myself sit up straight and forced a smile. "You're right. We're both pretty smart. We ought to be able to cook up some sort of plan."

An hour later, when the Peacekeeper who had held me at gunpoint brought the slightly bruised Elders Joyce, Drake, and Edwards in and locked them in Detweiler's former cell the two of us were no closer to a brilliant workable plan.

It was going on 0200. Tim was asleep, curled like a puppy at the end of the bunk and snoring softly. The Elders had finally given up fretting and praying, and gone to sleep as well. They snored louder.

I sat there in the dim red light, glumly contemplating this inglorious end to my largely undistinguished career. I gazed listlessly through the bars at nothing, thinking that if I survived this I was going to get the name of the clerk who got me assigned to Eden and make the drone pay.

When a large silvery shape suddenly loomed out of the darkness before me I let out a yelp. Before I could make another sound an arm slid through the bars and a hand covered my mouth. A hand large enough to cover most of my face.

Ms. Oldabe's face appeared between the bars. "Now you be quiet, OK Sheriff?" she said quietly.

I nodded and went *mmph.*

She removed her hand from my mouth. "How did you get in here?" I whispered.

"Been in here all along, Sheriff. Hid in the cleaning supplies closet when I heard the trouble start."

Something about her answer didn't ring quite right. There couldn't have been enough air in there to sustain a woman her size for that long a period. But that didn't matter now. Getting out of this cell was Priority One.

"Can you get us out of here? The

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

lock's manual code is 991818. They messed with the lock. I know they removed my handprint recognition release, and might have changed that, too."

"Well, let's give it a whirl." She hunkered down and went to work on the lock.

"*What's going on?*" I nearly jumped out of my skin at Tim's unexpected whisper in my ear.

"We're trying to break out. Ms. Oldabe is here to help us."

"Ms. Oldabe ain't doing squat," my aide reported, straightening up. "They changed the numbers."

I let out a groan. "Shit! Then we're stuck here."

"No," Tim said, "Gennie can get us out."

"How? I know she's pretty strong, but we'd need a hydraulic jack to bend these bars."

"Don't need one. Gennie, see that grille over on the far wall? The one with the little green light that blinks every so often?"

Ms. Oldabe turned to look. "Yeah."

"Well, that's the air quality sensor. Have you got a toilet plunger?"

She turned back, something like a grin appearing and then being forced down. "Sure. Why, is your crapper plugged up? If it is, you're gonna fix it your own self."

Tim stood up. "No, what I want you to do is dampen the edges of the plunger's cup, put it over the grille so it seals tightly. Push down to expel all the air, then pull back and hold it."

"Why would you want her to—" Then my brain caught up with my mouth, and my eyes went wide with excitement. "I get it! The sensor will read a vacuum and—"

"The doors will open automatically," Tim finished with a shy smile.

"Won't that set off an alarm, kid?" Ms. Oldabe asked.

He shook his head, foiled hair glittering brassily in the red light. "Not if you tell the board it's a test. Just punch 3-3-3 into the keypad."

"Wait a minute," I put in, seeing a flaw in the plan. "The door to my outer office will open, too. There's at least one heavily armed terrorist in a Peacekeeper uniform out there, plus the guy who gives him his orders. We'll end up dead, or right back in here."

Ms. Oldabe shook her head. "Naw, they're gone."

"How do you know, Ms. Oldabe?"

"I heard 'em leave. That closet shares a wall with your office. That's how I knew it was safe to come out."

"Then why are we *whispering*?" I whispered sharply.

"How should *I* know? *You* started it."

"You covered my mouth to keep me quiet!"

"So? At least I ain't a low-down tit grabber like you. Are you done harassing me? If you are, then I'll be about getting you boys out of the calaboose."

"If you're *sure* they're gone."

She grinned at me. "Trust me, Sheriff."

I really didn't have any choice in the matter.

Tim's plan worked like a charm. It seemed like a good idea to let sleeping Elders lie, so we left them snoozing away, their cell door slightly ajar. The three of us peeked into the outer office, went out when we saw the coast was clear.

"Now what, Sheriff?" Ms. Oldabe asked, as if I were the one in charge. Unfortunately, I was.

"We should, um . . ." I began, with no real follow-up in mind.

"Maybe we should use the security monitors in public cubic to see where the bad guys are?" Tim suggested helpfully.

I could have hugged him. "Right! You read my mind, Tim! You fire them up."

"Sure." He went to the small monitoring station set up on one side of the office, sat down and went to work.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"We gotta be on our toes here, Sheriff," Ms. Oldabe said quietly while Tim instructed the search program to look for movement. Since it was after 0200 on a religious settlement, there wasn't much. Come 0500 they'd all be up and at it. Early to bed, early to rise was one Lunarite credo.

"You mean for a change," I said bleakly. I wasn't sure what good locating armed extremists would do. The three of us were unarmed and utterly unprepared to deal with this sort of situation.

"Epson Detweiler is a very bad man. No matter how bad you think he is, he's worse."

"I know he was nasty to you—" I began.

The stern, composed expression on her face stopped me cold. "The man is smart, vicious, cruel, and has no conscience," she said, suddenly looking tough and capable in spite of the bizarre makeup and wild hair. "Remember that."

"I'm not finding anything, John," Tim called. "Do you think they left already?"

"Let's hope so." Maybe we wouldn't have to face armed lunatics after all. "Have you checked to see if the shuttle's still here?"

"Doing that now." The boy's slim fingers flew across the controller pads. In a matter of moments the monitors showed the two airlocks, the smaller one for personnel and the larger for cargo. When the shuttle came, it locked onto both at the same time, allowing for the simultaneous exchange of people and cargo. "Even with the comm network down there are hardwired data lines, so I should be able to . . . yeah, the shuttle is just leaving now."

I let out a breath I hadn't known I as holding. "That's a relief!" Maybe the worst was over.

"Wait, I'm getting a warning about the personnel bay airlock systems. I think—"

I could see the reason for the warning there on the screen. I moved closer. "The outer airlock door is wide open," I said pointing at the problem.

"Sheriff," Ms. Oldabe said softly beside me. I turned to look. She stared back at me, some not quite decipherable message on her face. But her warning tone was unmistakable.

"Tim," I said in as offhand a tone as I could muster, "Let's see if we can find the problem. Call up the view inside the airlock, will you?"

"Sure."

"Now pan around."

The view began to move.

"Stop. Back up a bit . . . there."

Sitting in the middle of the airlock chamber floor was a cigar-box-sized object with some sort of control panel on top. I swallowed hard, then forced out the words, "Zoom in."

The view enlarged, showing a digital readout on the panel. It read 1:58:21.

The numbers were counting *backward*.

"Is that what I think it is?" I whispered when I found my voice again.

"I do believe it is, Sheriff," Gennie Oldabe murmured beside me.

"John," Tim said, his voice cracking. "I don't know what you guys think, but I think that's a *bomb*."

The three of us headed for the bay at a dead run. When we arrived we found out that our situation was even worse than it had looked from a distance. Which was plenty bad enough.

The airlock's outer door mechanism had been sabotaged in such a way that it was going to take hands-on repair before it closed again. We couldn't depressurize the whole personnel bay to allow the opening of the inner door—the Stern Fathers' crowned male symbol had been burned in the steel doors, ruining their ability to hold pressure. That left our only option suiting up, exiting through the bigger cargo lock in the next cubby over, and getting to it that way. And incidentally moving the bomb—if it was movable—while we were out there.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Big, black Xs had been burned into the chest of each of the hardshelled worksuits. There was no way to leave pressure and go out to do anything that might save us.

Not knowing what else to do, I headed us off toward Eden's communications center to see if we could scream for help from there. It took considerable self-control on my part to keep from screaming all the way there.

The small public comm/post office in front of the Hinmans' cubic was a shambles. Mail was scattered everywhere, and the big Lucent multichannel transceiver had been torn from its rack, flung to the floor, and had the hell beaten out of it. The smaller, low-power base-to-ship radio had been similarly destroyed. While we were taking stock of this we heard the sound of muffled groaning.

Matthew Hinman had been trussed, gagged, and shoved into a mail sack. I put Tim to work trying to salvage the satcomm, then Ms. Oldabe and I began extracting Matthew from the bag.

"He's bruised, but I don't see any gunshots," I said as we carefully pulled the bag off him. "Thank god for that."

"They took *Leah!* " Matthew gasped when Ms. Oldabe pulled away the tape over his mouth. "They took her and I couldn't—couldn't *stop* them!" Then he broke down and sobbed.

"We'll get her back," Ms. Oldabe promised in a gentle tone. She glanced at me. "Right, Sheriff?"

I nodded. "Sure." I hoped to hell she had a plan to back that promise up, because I sure didn't.

"The comm's totaled," Tim reported. "The dish is still out there, but we've got no way to talk to it. If we had a day or so, I might be able to scrounge enough parts to repair it, but . . ." He spread his hands.

"No spare?" I asked Matthew. The young man shook his head mutely, tears rolling down his face.

"Tim?" Ms. Oldabe said, "Would you mind giving this fella some first aid?"

"Sure." He went for the first aid kit Velcroed to the wall by the community bulletin board.

Ms. Oldabe touched my elbow. When she had my attention she cut her eyes to one side, indicating that she wanted to talk to me privately. We moved away, and I watched Tim try to repair the physical damage Detweiler had inflicted on Matthew. Only getting his wife back would heal the deeper wounds. When I thought about shy, demure Leah in the hands of that animal and his friends, I felt sick to my stomach. The man referred to women as sperm sumps. I could only guess what he might do to one he held captive.

"We got us a big problem here, Sheriff," Ms. Oldabe said in a low voice.

"No shit," I answered grimly. "We're absolutely and completely fucked."

"Not necessarily. If we could find some other way of getting a message out I might be in the way of maybe bringing us some help."

I stared at her. "What do you mean by that?"

She smiled mysteriously, a dark harlequin Mona Lisa the size of a heavyweight boxer. "Let's just say getting a short message out might just save our butts. I don't know about you, but I'm damn fond of mine."

I sighed wearily. "*How*, Ms. Oldabe? You heard Tim."

"I'm asking *you*, Sheriff. This is your turf. There must be some asset we can lay hands on. Maybe somebody here's got a secret uplink of their own?"

I shook my head. "These are Lunarites. They use old-fashioned videophones, and pick up incoming messages here as mail."

"Damn. If it was dark we could maybe flash the lights inside the dome, send a message that way. Problem is, it's full Sun."

"Who'd see the flashing lights?"

"Peacekeepers up on Lunula Station keep the Moon's surface under constant

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

surveillance, AI's watching for anything unusual. Crashes, blowouts, unauthorized landings, that sort of thing."

"How would you happen to know all this, Ms. Oldabe?" A good question, but given our history so far, I doubted I'd get a straight answer.

Her smile was enigmatic. "Are you questioning *me*, Sheriff? Don't bother. Better you should be thinking us out of this bucket. Isn't there some way we can make a message visible from space?"

"Uh, John," Tim said, coming to join us. "Can I send for Doc Watts? I think maybe Matthew could use a tranquilizer or something."

"Sure, what ever you think is best," I replied absently. Could a slayte interface with the dish outside and send a low power signal? Maybe, if we had several hours to mess around figuring out how. I was beating my brain as hard as I could, but it might as well have been a brick of Spam.

"And I don't want to bother you," Tim continued, tugging at my sleeve to get my attention back. "But I really think we should notify everybody about what's going on."

"Why?" I shot back, exasperated. My brain hurt already, and trying to think and answer questions at the same time was just making things worse. "There's nothing *they* can do."

"Well," the boy said patiently, an earnest expression on his face. "They can pray, John. I intend to."

This brought me up short. I stared at the boy, feeling old and mean and stupid, then managed a smile. "Sure, son. You pray, and I guess we can tell everybody else to if you think we should. I didn't know you were, um, religious."

He ducked his head shyly. "I don't have the spirit my folks have, but sure, I believe."

I bit his lip and rested my hand on the kid's skinny shoulder. "Tim, I wish your folks and the Elders could see you now. I think they'd be proud, and finally realize that all that other stuff you're into . . ."

I blinked, the contents of my head going *snap!* as perhaps the brightest, most beautiful idea of my life was born. My jaw sagged open, and I'm quite sure I giggled.

"John," Tim said worriedly, "Are you all right?"

I shook myself and grinned. "Maybe we all will be."

Ms. Oldabe and I followed Tim as he raced down toward the lowest level of Eden. She didn't have any trouble keeping up, and if she hadn't grabbed me a couple times I would've caromed off a couple walls and maybe even the ceiling on the way. My lunar hot pursuit sucked, no two ways about it.

He led us deep into the gloomy maintenance tunnels under Eden's living and farming cubic, finally stopping by a door marked WARNING: HIGH VOLTAGE. Taped below that was a sign reading DANGER OF ZOOS RAYS! KEEP OUT.

"So this is your secret hideout," I said, shaking my head in bemusement as I watched the boy punch a series of numbers into a keypad mounted on the doorframe. I doubted that any of Tim's Lunarite brethren would know that the Zoos Rays were an obscure sambop band from a time when I was still listening to such stuff.

"Yeah, sometimes a mac needs a place to hide."

"Don't I know it," I answered, thinking of my own closet-sized VirtYou, and the placid morning I'd spent casting for ethereal trout. It felt like years ago.

The door opened into what could pass for a teenager's bedroom anyplace other than an austere religious settlement like Eden. Junk everywhere. Posters. Pinups. Technoprojects in progress. And over in one corner, an older but well cared for Cogistics AI enabled workstation.

"Sorry about the, um, you know . . ." Tim mumbled to Ms. Oldabe, trying to interpose his small body between her and an enormous nude pinup of Filome-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

na Soon, the model for his own five-square-kilometer homage. He managed to act as bikini bottom, but little more.

Ms. Oldabe inspected the artifact with a raised eyebrow. "She looks smarter in person," she said at last. "And shorter."

Tim's eyes went wide with awe. "You've *met* her?"

I didn't give her a chance to reply. While I'm as fond of naked female celebrities as the next man, the clock was ticking. "Okay, Tim," I said, "I want you to do your graffiti thing for us. You need to write a message big enough to be seen from space. Lunula Station to be exact."

"Sure." He went to the workstation and sat down. "What do you want me to write?"

I looked to Ms. Oldabe. She nodded. "Okay Tim, you need to write exactly what I tell you," she said. "It's all letters and numbers, but the people who see them will understand."

He woke the workstation and waited with his fingers poised over the keyboard. "Ready when you are."

"Here we go. The first letter is a C, followed by a colon, then G-M-L. Another colon. Then V-R-E-1, space, T-2-1-E, space, E-A-1. Got that?"

He read that back, then asked how big she wanted the message.

"As big as you can while getting it written down as instantly as possible." Instantly sounded good to me.

Tim stroked his chin, rapidly hammered in a query. He studied the answer a moment, posed another. "Will letters a hundred meters long work? I can manage block letters that big in about five minutes if I take the propellant conservation blocks off."

Ms. Oldabe studied some invisible point above us, thinking. I studied her. By now it was obvious that she was more than just a simple aide. The question was, *what?* I hoped I lived to learn the answer.

"Should do it," she drawled at last. "Plain letters. No Old English or that sort of crap."

"Here we go." The boy went back to work, fingers flying across the keyboard. I had to wonder what he could have done with newer equipment and a QwikLink. This kid was born to herd tech, not grow lettuce. I forced the thought away—there were more important issues to be dealt with. Like surviving this mess.

"So what does all that mean, Gennie?" I asked, a moment later realizing that I'd called her by her first name.

A faint amusement told me she'd noticed, but her answer stuck to the matter at hand. "VRE1 is an emergency vehicle recall. They'll find the nearest vehicle, namely the *McDevitt*, override onboard control, and send it back here. T21E is a category 21 terrorist incident, hostages taken and explosives set to cover their getaway. EA1 is a call for emergency assistance, Priority One. Troops will come scramble straight down from Lunula."

It hadn't escaped my notice that she omitted telling me what the GML meant, but I let it slide because of the implications of that vehicle recall.

"You want the *McDevitt* brought back *here?"* I sputtered. "Are you *nuts?* It's full of *terrorists*, remember?"

She shrugged. "I admit it ain't the greatest plan."

"You can say that again!"

She held up one finger. "But."

"But what?"

"First, it brings Leah Hinman back. Second, the recall will put the *McDevitt* and its passengers right up against the airlock."

I shook my head. "How's that going to help?"

She beamed at me. "Well, I'm thinking when that happens the bad guys will sorta find it in their best interests to defuse that bomb. What do you think?"

He stared at her, then nodded. "Yeah, I think you're right. I should've thought of that." Then I thought of something else. "That's still going to leave us with

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

one big problem."

"What's that, Sheriff?"

"Detweiler and his men will have their getaway ruined and be hauled back here to Eden. They're still armed, and they're bound to be really pissed off at *us*."

She put her arm around my shoulder. "Sheriff, there's one thing you gotta learn about this business."

I swallowed hard. Being in physical contact with her was almost as disconcerting as being near that bomb; a proximity to immense dangerous energies not even remotely under my control—except I didn't have the hots for the bomb. "What's that?" I asked hoarsely.

"No plan is perfect."

Gennie left me to ponder that bit of philosophy and went to watch the progress of Tim's work. On the screen the radar images of small, fast-moving dots left traces that formed the strokes of letters. "This is pretty damn dive, Tim," she said approvingly. "I also heard about your big nekkid lady. Tell mamma how you done it."

The boy glanced past her at me. I smiled in encouragement. "You might as well, son. If this works everyone's going to thank you for it. If not, no one's going to know."

"Okay. Well, Eden is situated in a mare, basically a big bowl of dust, right? The arrival of the shuttle, or any other outside activity stirs the stuff up. We need the sunlight to grow crops and produce electricity, so like most places we have standard Winstead Dust Devils to do keep the dome and panels clean. They move the dust around by using a static charge."

"How many of them are there?" I asked.

"We started with five. But I sort of convinced the Elders that it might be, um, prudent to have spares. So they let me get ten more, and I sort of messed around with their propulsion and guidance packages."

"Let me see if I get this," I said, joining them. When I'd asked before how Tim had done his monster tags the boy had clammed up. Now I was glad he had, because if I'd known I might have been stupid enough to fix them. "So your drawing was made by electostatically rearranging lunar dust?"

"Yeah. In graffiti mode, the charge they lay down causes the dust to puff up. That creates an actual ridge. Because the treated dust is less dense, and more particles are exposed to the light—and reflect it—the lines look almost white against untreated dust. Shadowing of the ridges just gives the lines more definition."

I could only shake my head in admiration at the boy's ingenuity. "That's why your naughty picture faded within a few hours. The static charge leaks away, and as it does the dust settles back down again."

"Yeah. It's not like I *hurt* anything. I was just goofing around." In his voice as an echo of the pain and bewilderment of his being disowned and deported for a harmless artprank.

Right then and there I decided that if we survived the kid was staying. Even if I had to adopt him to make that happen.

"I know, Tim. Now you've got a chance to save everything."

Since we were still cut off from the outside world there was no way for us to know if our message scribed in the moondust had been received. Nor would we know if the shuttle was returning until it came within range of Eden's low power radar.

All we could do was return to my office, gather up anything that looked like a weapon, and return to the bay to wait. Tim went armed with his slayte. I had my stun-pistol back, along with a nightstick, and a compressed-air powered webslinger. Ms. Oldabe rummaged in the Station's small refrigerator, helping herself to a beer and a squeeze bottle of Ho Fat's Double Plum Sweet and Sour

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

sauce. The beer was inhaled in a single awesome gulp, and the sauce bottle went into one pocket of her silver biballs. I didn't ask.

Before we left, I added a half dozen pairs of NySteel handcuffs to my arsenal, feeling like that was an act of baseless optimism not unlike a teenager taking along a package of condoms on a first date. This was after making a down-wide announcement ordering everyone to stay in their cubbies and prepare for a possible major pressure breach. The Lunarites had built a sturdy settlement. If the explosion wasn't too big some might survive in their airtight cubbies. I also did as Tim asked, telling everyone they should probably pray.

The three of us returned to the bay, three mismatched warriors preparing to make their last stand. I had fretted about bringing Tim along. If Detweiler and his men returned there was certain to be violence. The bay would be no place for a fourteen-year-old boy.

But this particular fourteen-year-old had done more to deal with the situation than I had, and chances were we would need his help again.

Now I knew how it felt to send a child into war.

I didn't like the feeling one damn bit.

"Nookie?"

I blinked, startled from my gloomy thoughts. "Excuse me?"

Gennie Oldabe pulled a deck of cards from the front patch pocket of her silver biballs. "Want to play a couple hands of Nookie, Sheriff?" She squinted at me suspiciously. "What did you think I said?"

I just stared at her. "There's a bomb set to go off in—" I glanced up at one of the bay's wall monitors. "—twenty minutes and you want to play *cards?* "

Her broad forehead furrowed. "Why, do you think we've got time for chess instead? I figured you for a man who pondered every move, but we could start a game on Tim's slayte."

"How can you—" I shook my head, sighed. "Aren't you afraid?"

She cocked her head quizzically, looking as if that was the oddest question she'd ever been asked. "A little, I guess," she allowed at last. "Why? You offering to make me feel safe by holding me in your big strong arms?"

I had to laugh. "That sounds nice, but improbable. Besides, I'm shaking so hard I'd probably give you whiplash."

She patted my arm. "You're doing just fine, Sheriff. So you *have* been looking at me and thinking things."

"Maybe a little," I admitted.

"Maybe a *lot*. You've been undressing me with your eyes so much it's a wonder I ain't caught a cold from the breeze up my—"

"Maybe we should put this issue on hold," I put in hastily, embarrassed and painfully aware of the young man dozing within earshot. "Talk about it if we survive. But I would like to ask you a question, if I could."

"Sure, but I'm not promising to answer."

I took a deep breath, the popped the question. "Who the hell *are* you, anyway? I never requested a station aide. I didn't think much about it then, but now I have to wonder why it was you turned up so soon after I took Detweiler into custody. So tell me the truth. Are you a cop?"

She smiled and held out her arms. "Do I look like one, Sheriff?"

I took in the grand, tacky spectacle of her silver biballs, purple hair, rainbow finger and toenails, and plastic toy jewelry. "No, not really."

"I should hope not. What do I look like?"

"Someone who is entirely happy with who she is," I replied, the words rolling out all by themselves. "And damn well ought to be."

Her smile widened, becoming something that made my breath catch in my throat. "Thank you, John," she said with a queenly nod. "I believe that might be

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

the nicest compliment I've ever been given."

I ducked my head shyly, looking for more words but basically tongue-tied with embarrassment. Before I had a chance to mess up the good impression I'd just made, I was saved by the bell. The deep-toned chime signaling a vehicle coming into radar range sounded.

Tim sat up, rubbed his eyes. "Is that the *McDevitt* coming back?"

Gennie and I exchanged a glance, then stood. "Yeah," I said, "I think it is."

Tim climbed to his feet, yawned, looked at us hopefully. "Any idea what we're going to do?"

"Actually I do," Gennie said. "I managed to grab a little bit of time to think between bouts of the Sheriff here trying to sweet-talk his way into my pants."

This comment had Tim staring at me with a mixture of amazement and awe mixed with aghast surprise that adults could think about sex at a time like this. Especially *old* ones like us.

I pretended not to notice. "What do you want us to do, Gennie?" I guessed it was safe to use her first name on a regular basis now. If not, I was probably going to die soon anyway.

"Tim, I want you to go back to your hideout. You can take emergency measures from there if things go bad, and I want them to be able to see you on the monitors here. This gives us an asset outside their control. Head there now, and keep a two-way open with us. OK?"

"Sure." I watched the boy head out, glad he was going to be out of harm's way after all. When Gennie Oldabe turned to face me I gave her a nod of thanks. She acknowledged it.

"So what do you want me to do, Boss Lady?" I asked.

"Gimme your nightstick."

"OK." I handed it over. She pulled the bottle of sweet and sour sauce out of her pocket, squirted a liberal dollop of the gooey red stuff onto the working end, handed it back. Then she began squeezing the sauce into her hair. Once it was dripping slowly down her purple dreads, she stuffed the bottle back into her pocket. Reached up and caught a dollop of sauce on her fingers, then smeared it all over her face.

I watched this performance in silence. At first because I was afraid maybe she'd snapped under the strain, then because I got an inkling of what she had in mind.

"How do I look?" she asked at last.

I snorted. "Like Chinese takeout for a family of cannibals. A *large* family."

"Think so? Well, keep your chopstick in your pocket, Sheriff. Now gimme a set of them cheesy handcuffs."

"Okay, but they're not cheesy. They're standard issue NySteels." I watched her cuff her own hands behind her back.

"Sheriff," she said in a pitying tone, "Maybe if you're real sweet I'll get you a set of PermaLoks for your birthday. Let you see what real hardware's like."

"*What're you guys doing?*" Tim asked from an overhead monitor. He must have run all the way to his hideout to get there that fast.

"Playin' hide the pork roll," she answered with a chuckle, laying herself down on the bay floor. "See my head? Didn't duck the sauce fast enough."

"*What does that mean, John?*"

I shook my head. "I have no idea, Tim. I'm Lo Mein on this totem pole." I watched Gennie move around and get comfortable. "What am *I* supposed to do?"

She smiled up at me. "Just be yourself, Sheriff. Here's how I want you to do it . . ."

The *McDevitt* returned to Eden, locked back on. Gennie had Tim override the cargo lock so that they had no choice but to enter through the personnel bay. Just as she predicted, Epson Detweiler sent one of his men out to defuse the bomb. Once that was done—much to my deep, if temporary relief—he and his two men returned to Eden.

Just as I had predicted, they were ex-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

tremely pissed off.

I stood there in the middle of the bay floor like some bizarre big-game hunter, red-dripping nightstick in my hands and Gennie Oldabe on the floor at my feet. This vista of me and my trophy presented a strange enough sight to momentarily stall Detweiler's forward charge.

"What do you think you're pulling here, Andrews?" he demanded from just inside the inner lock door, his men flanking him with their weapons pointed in my direction. All three men were hard-faced and grim, primed to shoot anything that moved or talked back.

I swallowed hard. "My job. Protecting this place, and the people in it."

The male supremacist shook his head, his eyes never leaving me. "Bringing me back here was not the way to do it, Constable. It was an even bigger mistake than arresting me in the first place."

"I didn't do that." I indicated the woman at my feet. "*She* did."

He glanced down, gave me the cold stare again. "Who, the Great Black Whale? What's some worthless scut-working sperm sump got to do with this?"

"I'm not sure, but I think she's an agent of the UN Peacekeepers."

Detweiler turned his head slightly to glance back at the men behind him. They shrugged as if to say they didn't know. He faced me again. "I find that hard to believe."

"You better believe it! She engineered the shuttle being recalled. Her and *him.*" I pointed up at the monitor showing Tim. The boy grinned and made a mildly obscene gesture.

"But," I continued hastily, "There might be a way to fix things so nobody gets hurt." As I said this Ms. Oldabe groaned and moved slightly.

Detweiler crossed his arms, stared expressionlessly. "I don't really care if anybody gets hurt. In fact I would feel much better if someone did."

"That may be, but you *do* want to get away. I want Leah Hinman back. You give me Leah, and you can have her." I nudged Ms. Oldabe with my toe.

She groaned louder and rasped, "You can't do that," in a thick hoarse voice.

The terrorist smirked. "Why would I want to trade such a tender young treat for a pile of overaged lard? Although I must admit you did an admirable job tenderizing the meat."

"Because if she's what I think she is, she'll make a better bargaining chip than Leah. And if you don't, I'll have Tim lock the shuttle here permanently."

Detweiler's cruel grin vanished at my threat, leaving an expression of cold unmitigated menace. "You can't do that."

I tried to summon a smile. "Actually I can. You broke our outer doors. All Tim has to do is invoke emergency procedures and that ship has to stay there until the airlock's fixed. Standard safety rules and hardwired routines."

He shook his head. "That would be a very stupid move, Constable. Stupid and fatal."

I believed him, but struggled on gamely. "Look, she's already yelled for help. If you want a chance to get away, it's going to be on those terms."

Ms. Oldabe lifted her head, leaving a red blotch on the floor. "You ain't *ever* getting away, you pathetic pile of weenie-wagging shit."

Detweiler lowered his gaze and his face darkened. "Shut up."

She wriggled around so she faced him more squarely. "Face it, honey. You just ain't got what it takes to come out on top when you're dealing with a woman." The scorn in her voice was acid enough to etch lines in the stone floor between them. She lifted her chin in defiance. "'Specially one like me."

"I told you to shut up." He reached inside his jacket and withdrew his pistol.

"Yeah, that's it," she mocked. "Must help a bit to know that at least there's *something* won't misfire when you try to use it."

He started toward her, gun pointed in her direction. "*I told you to shut up!*"

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

She chuckled. "There ain't nothing wrong with being afraid of women, limp boy. For you, it's probably a good idea."

"*I'm not afraid of women,*" Detweiler roared, the barrel of his pistol a handspan away from her forehead.

I watched Gennie Oldabe stare back up at him, and if there was one sliver of fear anywhere in her tremendous body it didn't show. Her smile widened. "Naw, not as long as you've got them at gunpoint. What a chickenshit. You oughta change your name to Mister Mousey 'cause you're so goddamn afraid of—"

I had been watching Detweiler's face go black with rage, his shoulders swell with fury. Any second he was going to pull that trigger. I didn't think about what I did next, it just sort of happened. I whipped my nightstick around in a vicious arc that took me and my target completely off guard. The baton connected with Detweiler's hand with a meaty *crack*. The blow drove his hand aside, and the gun went flying from fingers pointing in brand new directions.

I admit I froze. I hadn't known I was going to do that, and so had nothing like a follow-up planned. Just as Detweiler bellowed in pain and rage there was a second *crack*, and Gennie Oldabe rose up between us with what seemed like impossible speed for a person her size. Broken chain dangled from the handcuffs on her wrists, and her grin was fierce and alarming. She snatched Detweiler off his feet and wrapped her arms around him. With a yell of "Get behind me!" she whirled to face the two renegade Peacekeepers, using their leader as a shield.

"Put those guns *down*," she called in a voice I hadn't heard before, one carrying several megatons of authority. "I order you to surrender."

The men flinched, and for just a moment I thought they were going to obey. Then they tightened their grip on their weapons. As they did this music suddenly burst from the overhead monitors, loud crashing cydub blaring loudly.

"Let him *go*," shouted the one on the left, trying to make himself heard over the racket. "You're a lot bigger than he is, bitch! I can miss him and still ding you!"

Gennie tightened her grip on the squirming, cursing Detweiler. "I'll break his fuckin' neck."

"*Shoot her!*" Detweiler raged.

"Look, fellas." Ms. Oldabe called, "If you don't put those guns down they're going to be taken from you."

"Yeah? Who's going to do that?" sneered the man on the right. "I'm giving you the count of three to put him *down!* He settled his rifle against his shoulder. *One!*"

"I warned you," she said with mock sadness, looking behind them.

"We're not gonna fall for that! *Two!*" He squinted along the barrel, finger tight on the trigger.

The music stopped suddenly, and the dozen grim-faced Lunarite men who had been advancing barefoot from behind laid sinewy, work-hardened hands on them then. There wasn't really any violence in what happened next; the two troopers were divested of their weapons, body armor, and even their clothing with the same brisk efficiency I'd seen these men use to pluck poultry. In less than a minute, they were naked and bound with rope.

"Sheriff," Gennie called while this was going on. "Would you mind cuffin' this wiggly damn thing so's I can get it off my hands?"

"Sure." I moved to get Detweiler in restraints.

"*I show two ships coming in to land, John,*" Tim called over the monitors. "*What should I do?*"

I looked to my erstwhile aide for an answer as I manacled the terrorist's wrists behind him. He cried out and cursed as I grabbed his broken hand. I didn't let that stop me. Just to be on the safe side I used two sets of cuffs.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"Release the *McDevitt* from the airlock. They can remote it out of the way," she answered. "By the way, kid, that was good thinking, having your people come around from behind through the shuttle using the cargo lock."

I stared up at her as I locked cuffs around the prisoner's ankles. "You mean you didn't set that up with him ahead of time?"

"Nope." She laid Deweiler on the floor, stepped back and watched him struggle against his bonds with obvious amusement. "No more than I set you up for that line drive on old Epsie here at the right minute."

I started to feel sick. "You didn't have a plan? You were counting on *us* to bail you out?"

"Sure. Worked just fine, didn't it?"

"But that's *crazy!*"

She beamed at me. "You sure are a quick one with the flattery, Sheriff."

Ten minutes later the bay was full of people and noise. Over a dozen Peacekeepers in full riot gear had arrived, and more were standing by in another ship outside. It didn't escape my attention that each and every one of them saluted Gennie Oldabe, and their leader, a fiercely tattooed Maori man with a colonel's insignia, deferred to her like she might just be God.

More Lunarites had come, bringing Matthew Hinman with them. He had a tearful reunion with his beloved Leah, who was a bit bruised but basically unharmed. She told us that the *McDevitt's* sudden and unexpected recall had come just in time to save her from worse treatment. She didn't offer any details, and we didn't ask. It was enough that she was back.

Tim and I sat off to one side, watching the pros handle the situation. I nudged the boy's shoulder. "We did good, didn't we?"

Tim nodded, smiled shyly. "I guess we did, John."

"I'm proud of you, son. I couldn't be more proud if—"

As if calling the boy *son* were some sort of signal, Jebadiah and Martha Waugh came in and headed straight toward us.

Tim's face went pale. I patted his knee and stood up to meet them.

"Constable," Jebadiah said with a stiff nod, not meeting my gaze. "Son."

"Listen, folks," I put in before they could say more. "This boy of yours just helped save this place from being blown to kingdom come. Saved your and everybody else's lives. He was able to do that because he's smart and clever and unconventional. I admit he's not your ideal Lunarite, but he's probably the best damn Edenite you've ever produced. So let me tell you this: If you still insist on disowning him, *I'll* adopt him! If the Elders think they're going to deport him they've got another thing coming! Like I said, I'll adopt him. I'll hire him as my aide. He's staying, and he cares more for you and this place than any of you ever cared for him, and I think it *stinks!*"

Tim's parents absorbed my tirade in silence. "General Lincoln already called us, Constable," Martha said quietly when I was done.

"General *who?*"

"She told us what our son did. We understand how greatly we have sinned against him. We ask to speak to him privately so we can beg his forgiveness. Please."

I looked into their faces. Martha was solemn, her gaze haunted. Jebediah's bearded jaw was set, and he appeared on the verge of tears. Tim stared at his hands, pale and scared.

Ms. Oldabe appeared at my side. "Come with me, John," she said in a suprisingly gentle tone, taking me by the arm. I let her tow me away—not that I really could have stopped her.

Before we had gone a dozen steps, the colonel in charge stepped in front of us and snapped off a crisp salute. "General Lincoln?"

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"What's up, Don?" she drawled, reaching inside her biballs to scratch herself in lieu of saluting.

"Your suspicions that the Peacekeepers had been infiltrated by Stern Father sympathizers was correct, ma'am. They were helping keep Detweiler hidden in the first place, managed to keep him from being taken away by the last shuttle here, and then arranged for his escape. So far there have been five arrests back at Tycho, three up on Lunula, and several more back on Earth. This may not be all of them in on the conspiracy, but it seems to be a large percentage."

She nodded. "Good work, Don."

"Thank you, ma'am. May I compliment the constable in the fine job he did capturing and then helping recapture Detweiler?"

She eyed me a moment, then shrugged. "I guess he earned it, but go easy. Don't want him getting too big for his britches."

The colonel drew himself up and saluted me. "Excellent work, sir. You will certainly receive a commendation for your brilliant police work. No doubt a promotion as well."

I managed a shabby salute in response. "I didn't really do all that much." I jerked my thumb toward my companion. "Mostly I just tried to keep up with *her*."

The man grinned. "Sir, nobody can keep up with the Inspector General. She is, ah . . ."

"Incomprehensible?" I supplied.

The colonel laughed. "We prefer to think of her methods as *inscrutable.*"

"Meaning he don't have enough rank for a good scrute," she cackled. "Enough brass polishin', Don. Clear this mess away. Get these folks' airlock and comm capabilities back in service, then head back to Lunula."

He nodded. "Yes ma'am. Will the general be taking transport with us?"

She shook her head, which set fresh rivulets of sweet and sour sauce creeping down her dreadlocks. "Naw, I think maybe I'll stick around a couple days."

"As you wish. Should I order the *McDevitt* held over for you?"

"Don't bother. Besides, these folks still have produce to ship. I'll call for a ride when I need one."

"Yes ma'am." He hurried off to carry out her orders.

"General?" I said quietly.

"Yup?"

"You're *really* a general?"

She grinned. "Of a sort. I'm Inspector General of Special Investigations. Just a big cop, really."

"You're the General Lincoln they were talking about."

"Guilty." She stuck out her hand. "General Mona Lincoln."

"I get it. Gennie Oldabe. General Lincoln. Cute."

"Ain't I though?"

We watched Jebadiah and Martha Waugh walk by, Tim between them. They had their arms around their son's shoulders. Tim glanced in my direction. He was crying and smiling at the same time. So were they.

I knew just how they felt.

"No sense in callin' me General," my highly ranked former aide said. "Now that this mess is pretty well swept up we can both go off duty. You must be tuckered right out, Sheriff."

Now that she mentioned it, I was beat. This had been a far more exciting day than I was used to. "I guess I am," I admitted.

"I tell you, end of a day like this all I want to do is get out of uniform."

I eyed her askance. "You call that a uniform?"

"Well, sure. When you get to be a general you'll find out that any damn thing you decide to wear is a uniform. So what you say, Sheriff? You figure maybe us two old cops oughta go back to your place and take off our badges?"

I swallowed hard, unsure if she meant what I thought she meant—and hoping she did. My old shyness made it difficult to just say what was in my head, namely

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Race you there!

She held out her arms, the broken handcuffs still dangling from her wrists. "I'll come along quiet."

I took her hand instead. It was very large, very warm, and felt absolutely wonderful. "Should I read you your rights?"

She gazed down at me, a mischievous gleam in her big brown eyes. "I was kinda hopin I didn't need to remain silent. *If* you catch my drift, Sheriff."

"I believe I do, General."

"You may have to frisk me."

"I'll be gentle."

The Lunarites have some fairly strict prohibitions against extramarital sex, but for the short period General Lincoln stayed on Eden, they turned a tolerant and amused blind eye on whatever sinful acts might have been transpiring behind the closed doors of their Constable's quarters. In between times, Gennie—Mona—and I were feasted, honored, and multiply thanked by every man, woman and child living in Eden.

Five days after Epson Detweiler was hauled away, a Peacekeeper fast courier packet arrived to take General Lincoln off to some other peculiar mission.

I saw her off, then shambled back to the Station feeling like the circus had just left town. The paperwork—which I'm usually quite meticulous about—had fallen into arrears during her stay. So I sat down behind my desk and began glumly plugging away at reducing the backlog.

Not long after I started there was a knock at the door. I looked up, watched Tim come in. Just as the last few times I'd seen the boy, the silver foiling was gone from his hair. So was the eye makeup. But instead of the long-sleeved white shirt Lunarite men favored, he wore an Exploding Brain Food marqueetee.

"Hi, Tim," I said, gladly abandoning my paperwork. "How're things going?"

"OK I guess," he said with a vague shrug. I knew he was doing better than OK. He was trying to be less of a trial to his parents, and they in turn were doing their damnedest to accept and be happy with the son God had given them.

"So what's up?"

"Well, I was kind of wondering . . ." He shrugged and stared at the floor.

"Wondering what, Tim? You can tell me."

"That stuff you said to Ma and Pa. Did you mean it?" He raised his head an eyed me uncertainly.

"Every damn word," I answered honestly, looking the boy right in the eye.

He nodded, looking pleased. "Well, my folks and I have patched things up. Nobody's trying to kick me out right now, and I'm going to do my best not to give them a reason. The thing is, I was kinda wondering . . "

"What?" I asked in a kindly tone. I couldn't think of much I'd refuse him.

"I was wondering if I could be your aide here, like you said. I mean Ms. Lincoln is gone now, and, well . . ."

"I think that's a great idea!" I made no pretense of hiding my pleasure.

"Really?"

"You bet."

"Thanks! And I want you to know I won't embarrass you. No more graffiti. I'll wipe the program on my workstation and—"

He stopped when I held up my hand. "Now let's not be hasty, Tim. Your prank just saved our butts, and who knows, that graffiti program might come in handy if we ever have another major communications breakdown."

"Sure. If you think so," Tim agreed uncertainly.

"I do. Now are you ready to assume your official duties?"

"I guess. What do you want me to do?"

"Send a message for me."

"No problem. What is it?"

"'*Thanks, Mona*'."

"That's it?"

"Yep. That's all."

"Okay, you want it sent officially to

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

the Peacekeepers or what?"

"No, I was thinking of something more along the lines of writing it in letters a mile long."

Tim stared at me a moment, then a grin spread across his face. "A mile. That's about two klicks, right?"

"Close enough. In fact, I think we should embarrass the shit out of her. Can you put it in a big heart?"

He nodded rapidly. "I can do that, sure. Do you want to come watch?"

I stood up, hitched my gunbelt. "I do believe I should. This first monthly test of our Emergency Message System ought to get my personal attention. After this one we'll see."

Tim's grin was so big it threatened to swallow his ears. "Monthly? What are we going to write next time?"

My smile had a bit of resurrected teenager in it, and a nice big chunk of Mona Lincoln too.

"I'm not sure yet, but we've got a month to figure it out, right?"

"Yes, *sir!*"

Respect for the law is an important thing to instill in the young. ■

If a human being is condemned and restricted to perform the same functions over and over again, he will not even be a good ant, not to mention a good human being.

— Norbert Wiener

Each person's work is always a portrait of himself

— Samuel Butler

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

THE REFERENCE LIBRARY Tom Easton

Saturn's Race, Larry Niven and Steven Barnes, TOR, $24.95, 317 pp. (ISBN: 0-312-86726-3).

Wild Angel by Mary Merriwell by Max Merriwell, Pat Murphy, TOR, $23.95, 287 pp. (ISBN: 0-312-86626-7).

Brain Plague, Joan Slonczewski, TOR, $24.95, 384 pp. (ISBN: 0-312-86718-2).

Eater, Gregory Benford, Avon, $24, 340 pp. (ISBN: 0-380-97436-3).

Eternity's End, Jeffrey A. Carver, TOR, $ 26.95, 560 pp. (ISBN: 0-312- 85642-3).

The Bone Yard, Paul Johnston, St. Martin's, $23.95, 297 pp. (ISBN: 0-312-20280-6).

Uncommonplaces: Poems of the Fantastic, Judith Kerman and Don Riggs, eds., Mayapple Press (P. O. Box 5473, Saginaw, MI 48603-0473), $15, 138 + x pp. (ISBN: 0-932412-17-3).

Greetings from Earth: The Art of Bob Eggleton, Bob Eggleton, Paper Tiger (Collins & Brown; dist. in U.S. by Sterling Publishing Co., 387 Park Avenue South, New York, NY 10016), $21.95, 112 pp. (ISBN: 1-85585-662-X).

Inner Visions: The Art of Ron Walotsky, Ron Walotsky, Paper Tiger (Collins & Brown; dist. in U.S. by Sterling Publishing Co., 387 Park Avenue South, New York, NY 10016), $21.95, 112 pp. (ISBN: 1-85585-774-X).

Hello, Out There, Jack McDevitt, Meisha Merlin, $20 trade paper, $40 signed hardcover, c. 600 pp. (ISBN: 1-892-06522-3.).

Lilith's Brood, Octavia E. Butler, Warner, $13.95, 746 pp. (ISBN: 0-446-67610-1).

This month brings us a very nice array of angels and gods, beginning with an echo of ancient times, when Titans ruled and Saturn, the monster who devoured his own children, was overthrown by Jupiter. Larry Niven and Steven Barnes begin **Saturn's Race** in 2020, when Lenore Myles is visiting the floating city of Xanadu for graduation ceremonies. She is ready to begin her career as a biocyberneticist, but first . . . Here is the world ruled by the mysterious Council, porpoises and sharks whose brainpower has been electronically augmented, people who can link their minds to those of their augmented creatures, a man—Chadwick (Chaz) Kato—who reveals that he is the one who has followed her schooling, been her mentor, and now offers both passion and a different career.

But . . . Using Kato's security clearance, she wanders Xanadu and overhears an ominous conversation. She sits down to a computer terminal, chases down the clues she heard, and finds . . . . Quite enough of biotech used in frightening ways to send her fleeing homeward, but also to stir the mysterious Saturn from the depths in which he (or it?) hides. She has learned too much, and now she must die.

Fortunately, Kato gets wind of what is happening and saves her. Unfortunately, the experience damages her brain and costs her the memory of all that happened on Xanadu.

Years later, however, their paths cross once more when Lenore's ex-lover, a terrorist who yearns to bring down the edifice of power and privilege topped by the Council, brings her back to Xanadu in search of a way to repair the damage wrought by Saturn. Chaos and violence explode around them, the edifice collapses, and they flee.

To what end? In due time, we learn Saturn's identity—an ancient, hungry god indeed!—and aims. Our initial suspicions that Saturn was an AI like the fa-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

bled Neuromancer are not fulfilled, but I will say no more except that like many gods, he or it can die and be resurrected and even turn more benign in later incarnations.

This one has action and adventure enough to suit anyone. Niven and Barnes do not disappoint.

And now for an angel. Pat Murphy is still playing the recursive authorial game she began with *There and Back Again*, but where that was definitely SF, **Wild Angel by Mary Merriwell by Max Merriwell** has to be called something else entirely. Look back at the roots of the pulps in the dime novels of the nineteenth century, adventures in the Wild and Wooly West. Look at Tarzan, raised among the apes, and at Mowgli of the jungle.

And here is the Gold Country, infested by hard-working treasure hunters and a few SOB opportunists who rob and steal for their living. Meet Rachel McKensie, whose Mama is puttering about the family tent while Daddy pans for gold. A little while ago, two strangers passed up the trail. Now one returns, chats with Daddy, and shoots him down. Now it's Mama's turn, but before she dies she screams to Rachel, "Run and hide!"

So the child survives. Three years old, and alone in the wilderness—until the wolf pack arrives and she is adopted. She grows up strong and fast and wily, and eventually she falls back into human company. Here is Pat Murphy, marshal, and here Max Phillips, artist and writer with a past, a wife and daughter left behind, now a friend to a wild girl. Here is the murderer, now the sheriff, cold and calculating and still eager to erase all witnesses to his crime. Here are strangers, in trouble on the trail, aided by the wolf-girl and the fountainhead of legends about the Wild Angel of the Sierras.

And finally the circus comes to town, complete with elephant and a young woman from back East who will prove to have a startling connection to one of the major characters.

Not science fiction, but in its way very solidly embedded in the tradition. And a great deal of fun. Don't let it slip past you.

Joan Slonczewski's *The Children Star*, serialized here in 1998, offered a world of microbial intelligences that proved able to move into human beings. That quite naturally scared the dickens out of folks, but a *modus vivendi* was discovered—at least for some people. Different colonies have different personalities, different degrees of environmental wisdom. Some manipulate brain chemistry like a drug and multiply until they exhaust their host's resources; they comprise the **Brain Plague** of Slonczewski's new title. Others are more benign; they limit their numbers, build cities in the subarachnoid space around the brain, post emissaries in the eyeball to flash messages where the retina can pick them up, and enhance the host's brain functions.

That enhancement can be remarkable. The microbes live at a faster pace, and when they attempt to solve problems of art, architecture, stock trading, science, and so on, they can devote an entire civilization's effort to the task for generations while the host is waiting for that Tuesday meeting.

Meet artist Chrysoberyl of Dolomoth, talented and impoverished when word arrives that the culture of "brain enhancers" for which she has been waiting is ready. A show is looming, but it's now or never. And so she meets the society of symbiotes known as Eleutheria, immigrants into the new world that is Chrysoberyl, and they are entirely worshipful of the god that is their world.

Are immigrants boon or bane? That's a question that stirs passions in our own society. We are a nation of immigrants, grown rich and powerful on their vitality. Yet immigrants also clot the lowest rungs on the socioeconomic ladder, and

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

some see them as a threat to peace, order, and prosperity.

Chrys's art blossoms even as she discovers the antipathy toward microbe carriers that led to the murder of the architect who was Eleutheria's last home. That antipathy, of course, is fed by fear of the brain plague, which is spreading. The streets she walks are marked by more and more decrepit victims of the scuzzbucket plague microbes, who serve an "Enlightened Leader" whose minions spirit people away to a hidden Slave World.

People with brain enhancers use small "patches" that prick the skin to let their inhabitants exchange emissaries. Eleutheria likes to crossbreed with visitors, or even to accept them as immigrants. This becomes a problem when Chrys lets her natural sympathies overcome both sense and regulations and tries to rescue some of the inhabitants of a brain plague victim. Yes, there are agitators who wish nothing more than to bring her under the Enlightened Leader's sway, but there are also refugees eager for freedom, and some of them have talents Eleutheria welcomes.

Boon or bane? Eleutheria is an analog of America. Honesty demands that Slonczewski call the brain enhancers boon, but that she also see the brain plague as a threat. Yet the threat is hardly absolute. Human "Enlightened Leaders" are vanishing as it becomes clear that closed, exploitative societies just do not work well, and Eleutheria, guided by the Eighth Light of Mercy, hopes to make something similar happen with plague microbes and their victim worlds.

A very interesting book by a consistently interesting writer. Don't miss it.

Where's the god in Gregory Benford's **Eater**? Meet Benjamin Knowlton, astronomer, mostly an administrator, facing Ann Major, a postdoc with a funny data blip, a repeating gamma-ray burster.

A burster is supposedly a black hole swallowing a star. It doesn't repeat—it can't eat the same star twice. So this is interesting. Put the word out, get more data, and it's even more interesting. This burster is not in some distant galaxy. It's out past Pluto, eating iceteroids, and apparently using the energy gained from each meal to steer toward the next even as it bends its path toward Earth.

Knowlton has problems. His wife Channing is dying of cancer, but though she was once an astronaut, she is now an astronomer too. The burster fascinates her as well, energizes her, absorbs her. And when it sends a message . . . .

Well. The immediate effect is the takeover of the observatory by a transnational security agency. But the message is soon decoded to reveal that the visitor is older than the solar system, an intelligence encoded in complex magnetic fields, created by an ancient species struggling to survive their world's accidental encounter with a black hole. It's a wanderer, an explorer, and a collector. "Send me information," it says, even as it shares vast portions of its hoard. "And send me people. Here's how to copy their minds for uploading."

It wants a great many people. It even has a list. And when the world's surviving tyrannies start processing dissidents and minorities with a copying procedure that involves shaving their brains down to nothing, it approves. The process is much more thorough and effective than the simulation process used on Channing.

Unfortunately, there aren't enough dissidents. In freer lands, there aren't enough volunteers. So the Eater enters Earth orbit and wreaks havoc, burning forests and cities to enforce its will.

And it increases its demands.

What's to be done? This being fiction, there must be something, preferably involving a brave soul, a space mission full of derring-do, and the gratitude of the damned. I won't be more specific, but it's worth noting that Benford is the kind of hard-SF writer—a physicist himself—who pays careful attention to the details.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

One might think the Eater the sort of threat that simply cannot be countered, but Benford finds a way. Humans don't win just because they're humans and the fictive dice are loaded in their favor. They win because nature's laws are free for all to use.

Benford notes in his afterword that "the ideas in this novel are offered in playful speculation [showing] against an extreme backdrop, how scientists do think, work, and confront the unknown." The astronomer's perspective, he says is "grander and perhaps more cold than [that of] any other science" and this affects "how astonomers see the universe and our place in it. Such lessons are among the most subtle we can learn." They are also lessons much resisted by a great many people.

The latest installment in Jeffrey A. Carver's "Star-rigger" series is **Eternity's End**.

You may recall from earlier novels that "riggers" are essential to interstellar travel. They immerse themselves in a kind of virtual reality where they can imagine the structure of the "Flux" (think of hyperspace). That structure is in part dictated by their minds, but only within constraints imposed by the Flux itself. Perhaps the image is that of a sea, but a sea can be calm, stormy, beset by maelstroms and shoals. Within that image, the starship may be a frigate under sail, a gull, a whale, in each case propelled and steered by the rigger's will.

And lying within a fog bank or behind an island or—more treacherous yet!—behind the elusive Flying Dutchman of the Flux, the *Impris*, lost for over a century but still flying, appearing to riggers in the Flux and vanishing like a ghost, may be the dreaded pirates of Golen Space. Once those pirates fell upon the *Ciudad de los Angeles*, and its passengers and crew were enslaved. So too was rigger Renwald Legroeder, and ever since he has flown the pirate ships on their predatory missions.

But now he has taken advantage of a momentary lapse in security. He has leaped into a scout ship, fled the pirate base, and against all odds reached the world of Faber Eridani. Unfortunately, the Rigger Guild has disowned him and the government is charging him with complicity in the loss of the *Ciudad de los Angeles*. He—who ought to be hailed as a hero for his escape!—is in jail.

Something is very rotten in Denmark, folks. Fortunately, attorney Harriet Mahoney shows up ready to do a bit of investigating. Soon we can glimpse the outlines of a massive conspiracy that covers up the story of the *Impris*, shields the pirates, and wants Legroeder silenced, legally or not. Flames are roaring and bullets flying. Legroeder must flee to the alien Narseil in search of answers, and then despite immense misgivings join a secret mission to infiltrate a pirate base in search of an alleged underground.

Those misgivings are twofold: No way does Legroeder want to reenter the trap he just escaped, and no way does he see any chance of success. But he has already demonstrated in his escape a talent for the impossible, and he has no other choices. So it's onward with the one-man Light Brigade, straight into the jaws of doom and destiny.

Destiny, because of course he succeeds in the mission. He finds true love, cognitive dissonance, divisions among the enemy, ambitious schemes, another mission—this one deeper than anyone has ever gone before into the substrata of the Flux—and a final resolution that leaves the reader both breathless and satisfied.

The setting for Paul Johnston's **The Bone Yard** (the sequel to *Body Politic*) is a dystopia rooted in social collapse due to runaway drug problems and government corruption. The scene is Edinburgh, isolated from the ruins of the U.K. and ruled by a Council with the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

strange idea that Plato's *Republic* somehow holds the key to a decent society. Crime is low, but the people are starving, freezing, and infested with petty bureaucrats. And Roddie Aitken is knocking on the door of Quintilian Dalrymple, a free-lance investigator who had once been part of the system. Roddie says he is being followed by a mysterious hooded stranger. Quint says he'll see what he can do.

But by the morrow, poor Roddie is dead. Slaughtered and mutilated and a baggy containing a cassette of blues music inserted in his abdominal cavity. His tongue was cut out too, and when Quint nods wisely and opines that the killer must have wanted to keep his victim from screaming, I almost stopped reading.

One does not need a tongue to scream. Vocal cords, yes. The tongue is essential only for making words.

At any rate, I kept on. Victims accumulated. A strange drug known as "Electric Blues" showed up. A lady from Quint's past appeared. The chief of the Council warned Quint away from investigating the Bone Yard. The archives proved to have intriguing gaps. A shutdown nuclear reactor seemed to be involved. Quint got closer and closer to a very nasty truth. And in the end, Edinburgh is a cleaner sort of place. Unfortunately, it's still a dystopia.

A nice yarn, if anatomical ignorance doesn't stop you.

Judith Kerman teaches writing and multimedia at Saginaw Valley State University. Don Riggs teaches composition and science fiction at Drexel University. Together they have put together **Uncommonplaces: Poems of the Fantastic**. The book is an intelligent survey of the variety one can find in the poetic side of SF&F. The seventeen contributors (of 57 poems) were chosen because they have participated in the poetry readings at the annual International Conference on the Fantastic in the Arts held in Fort Lauderdale, Florida. The most familiar names to prose readers are Joe Haldeman, Jane Yolen, and Brian Aldiss. Many of the rest are, like the editors, academics. Some of the poems have very little to do with anything remotely sffnal; for instance, David Lunde's "Nightfishing" can be fantastic only to city folks who have never gone fishing. Joe Haldeman's "Fire, Ice" is just as poetic but surely far more familiar in its reflections on a cryonic afterlife.

Paper Tiger has put out two nice collections of SF&F artwork by well-known artists: **Greetings from Earth: The Art of Bob Eggleton** and **Inner Visions: The Art of Ron Walotsky**. Eggleton seems rather too fond of dragons and dinosaurs for my taste. They're *nice* dragons and dinos, you understand, but I like his landscapes and astonomical work more. The "Cosmic Hunger" piece on p. 99 would go very well with Benford's book above.

Walotsky has committed dragons too, but he strikes me as much more poetic and lyrical. The things he has done with horseshoe crab shells are astonishing.

NOTABLE REISSUES

Over a decade ago, Jack McDevitt published *The Hercules Text* (reviewed here in July 1987) and *A Talent for War* (July 1989). If you enjoyed them then, you'll be pleased to hear that they're back in a single volume, **Hello, Out There**, from Meisha Merlin ($20 trade paper, $40 signed hardcover; about 600 pp.). It includes an introduction by Jim Kelly.

Hercules, one of the Ace Specials of the time, dealt with the deciphering of an alien SETI signal and the impact of an ensuing flood of marvels; Jack writes that he updated and rewrote it for the occasion, removing the Cold War aspects and adding a new conclusion. *Talent* dealt with the aftermath of a war, a missing secret, and a lost warrior; in my

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

1989 review, I said it "confirms a prodigious talent for SF." McDevitt has, of course, kept right on confirming that talent.

Among Octavia E. Butler's science-fictional accomplishments, her "Xenogenesis" series occupies a prominent place. It began with *Dawn* (reviewed here Mid-December 1987), which gave us gene-trading, xenophilic aliens, the Oankali, salvaging post-holocaust humanity and creating strange hybrids. Her theme was the conflict of different types—species, races, genders—and the need for an intermediary like the aliens' third sex, the ooloi. The next two volumes in the trilogy were *Adulthood Rites* (December 1988) and *Imago* (September 1989); they developed the theme, brought the hybridization process to the point where a human ooloi—whose role is to blend disparate genomes—appears and proves able to bridge the gap between humans and Oankali, even though it has the extra arms, tentacles, and other features of the Oankali. Butler's point was that a people's changers or leaders must be drawn from among themselves. Martin Luther King had to be black. Mao had to be Chinese. Castro had to be Cuban. All the foreigner, the alien, can do is to help establish the conditions for change, to help King or Mao or Castro to appear. With that done, the aliens can leave while the locals work out the implications of change for themselves.

At the time, I said she may have "gifted SF with a vision of possibility more original than anything we have seen since Clarke's *Childhood's End.*" I also said that it might not be possible to read the series properly until the whole thing was in hand. Fortunately, you can now get all three books in one volume, **Lilith's Brood.**

Give yourself a treat.

To solve any problem that has never been solved before, you have to leave the door to the unknown ajar. You have to permit the possibility that you do not have it exactly right. Otherwise, if you have made up up your mind already, you might not solve it.

— Richard P. Feynman

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

BRASS TACKS

Dear Stan,

Your July 2000 editorial on decision-making when costs and benefits go asymptotically high and probabilities likewise low brought back memories of my systems management classes. It is somewhat of a new art these days to apply economic logic to a wide variety of decisions that aren't usually of in economic terms, and if memory serves, a recent Nobel prize in economics was awarded for such work.

Your editorial pointed to an area where the normal "expected value" model of decision-making breaks down, or becomes singular, in a way any algebra student would understand as value, reciprocal probability, and cost all approach infinity.

The expected value of a decision "E" is simply the value "V" of a given result times the probability "P" of the result. For net expected value, "En," subtract the cost C so that:

En = V*P - C

A rational actor in the economy will choose an action with a positive net expected value. The maximum one is willing to pay is what makes En go to zero:

C = V*P

If you pay more, your expected value is negative, so you don't do it. But, as you point out, the value of winning a lottery is not just the finite amount of money but freedom from having to get more money, and that the value of avoiding the loss, in the case of the dinosaur killer, not just loss of property, but your life and, indeed, all those future things for which you might be willing to die for. The logic breaks down when V approaches infinity at the same time that P approaches the infinitesimal (1/infinity). In that case, you get:

En = V*P - C

= (infinity)*(1/infinity) - C

= infinity/infinity - C

Unfortunately, as algebra students know, there are different kinds of infinities such that "infinity/infinity" is not definitely 1 and, in fact, may be anything. The expression is undetermined. But our cases concern probabilities that are not really 0, but small identifiable numbers:

P = 1/(not quite infinity), and so

En = infinity/(not quite infinity)-C

In that case, mathematically, E would be positive at any finite cost and a rational decision-maker would always choose to make the investment. But this is not what we do, and the answer, I think, is that C is not just money any more than V is just money. C can also approach infinity faster than its monetary cost. This is because the cost of the tickets, or the tax increase to pay for a space defense system, comes from marginal discretionary income; what you have left over after dealing with the cost of survival. C comes right out of your quality of life. Do you give up your *Analog* subscription to buy lottery tickets? Let's try to model it this way:

$En = V*P*Z_1 - C*Z_2$

Z_1 and Z_2 are multipliers that start at 1 and increase with the dollar amount in a function that, somehow, quantifies one's aversion to wage slavery, hope for one's children, desire to be part of a group or society that does great things, etc. These multipliers are necessarily wildly indi-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

vidual. Does that make a mathematical analysis of decision-making either too idiosyncratic or futile? Not really. In most of our lives, there's a range over which small costs and values can reliably be equated to dollars. In that range, Z_1 and Z_2 are approximately 1 and the formulae of rational economic decision making work well. But when Z_1 and Z_2 are significantly greater than 1, En is not clearly determined and choices in that regime cannot be described as either economically rational or irrational. Now, a prudent person generally avoids doing things that cannot be described as rational. But if one backs off the cost so that Z_2 is clearly near 1 for most people, then "clearly rational" choices become possible, if one can make a reasonable estimate of the expected value. What one is willing to pay becomes:

$C^*Z_2 = V^*P^*Z_1$

When the monetary value V and the probability P can be determined definitely (such as in a lottery), one's Z_1 function can be mapped by what one spends on lottery tickets. It is the nature of Z_1 functions that, at whatever individual rate, the net expected value approaches infinity faster than the probability approaches 1/infinity. I think this is why more and more people buy tickets as the total value of the lottery goes up, even though the odds get worse. With V at infinity, it always makes sense to make collective investments that cost a few dollars per person per year (Z_2 close to 1), regardless of the odds. By the same token, it is fair to describe the failure to do so as economically irrational. My longstanding failure to buy lottery tickets is not probably not economically rational; it is in part an emotional protest against the social cost of gambling and all that implies. But the fact that I already have a generous and secure pension makes my Z_1 stay near 1 over a wider range of values than most other people's. On the other hand, escaping the dinsoaur killer will have a near infinite value for everyone regardless of their Z_1 function. I have always been willing to put a few dollars a year into the asteroid avoidance kitty. It would be illogical not to do so.

Thanks again for a thought-provoking editorial.

Gerald David Nordley
gdnordley@aol.com

Dear Mr. Schmidt:

First, I want to thank you and all of your staff for so consistently producing such a high quality product.

The editorial in the June 2000 issue sparked two thoughts (you did your usual excellent "flint and steel" job of helping us to think). The first concerns the lottery. I wonder if people realize that they are involved with games of chance having players that stack odds against "normal" people even more so than casinos and other gambling entities. Specifically, I refer to insurance policies, and more specifically, to health, home hazard, and auto collision policies.

Most of us pay rather exorbitant amounts of money over our entire lives for "protection". Many people never receive benefits from their policy payments. Even when circumstances require receiving policy benefits, most people do not realize, until it is too late, that the payoffs from these policies do not even allow breaking even, let alone winning, because of co-pays, deductibles and value skewing to reduce the payments made by the polices.

The second thought concerns catastrophic event planning. It occurred to me that we are facing a catastrophic event now—a communicable, always fatal disease that has no cure. Yet, what reasonable preventive actions are being taken to protect those who do not have this disease? None, for all intents and purposes. Yes, there is research going on, but the traditional methods of preventing the spread of the disease (and the attendant demise of man), identification and quarantine of carriers, have not been implemented. What makes anyone

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

think that an asteroid would be treated any differently?

Please pass along my sincere appreciation to your staff.

John Harcinske
Manvel, TX

Dear Stan;

Your editorial in the June 2000 issue brings some comments to mind that are so disparate that they warrant two separate letters, but I'm going to discuss them all here.

For the first set of comments, I agree with your main thesis (I'll bet you thought I only wrote when I disagreed with you) but put it into somewhat different terms. Most people have to deal with the possibility of occurrence of low-probability events that are catastrophic if they happen. An example would be your house burning down. So to guard against these eventualities, and as a means of protecting the individual against catastrophes, we have insurance, which is one of the mechanisms society has devised for marshalling its resources to protect the individual against such low-probability events. To gain the benefits of insurance, of course, you must pay a fee up front, one that is small compared to the cost of the catastrophe (if it happens to you), in order to buy the protection. What I find somewhat surprising is that this analogy is never mentioned when discussing the possibility of larger catastrophes (such as meteor strikes), but it seems to fit pretty closely. I think that if it were to be put into more commonsensical and familiar terms such as this, the need and desirabilty of doing the preliminary work would be more easily accepted.

My second set of comments have to do with the lottery. Most people don't realize what a scam it is, or they wouldn't be so eager to play. If you or I were to do anything akin to what the lottery does, we'd be in jail so fast our heads would spin. I don't say this because of the low probabilty of winning, or even because the expectation is less than unity. I say it because you never ever get the prize money (except for the smaller prizes, which aren't important).

For the big prizes, the lottery rules allow the prize to be paid off in 20 years. That means that they only have to pay 5% of the prize each year. When you have that much money (a million dollars or more) it's easy to find safe investments that pay 5% or more. That means that the money that's paid to the winner is only the *interest* on the prize; the principal is never touched for the duration. At the end of the 20-year period, the lottery commission (or the state) gets to keep the original prize money after all, plus whatever extra interest came in above the 5% that they paid out.

As I said, if you or I were to do that we'd be in jail. Nevertheless, this has been declared legal by the courts, since you are effectively agreeing to those rules when you buy your lottery ticket. Nowadays there are lotteries where they do pay the money up front—but you'll note that the amount is heavily discounted. Figure out what the difference will grow to if invested for 20 years—the state still gets the entire prize money.

Also figure out what return on the discounted prize will equal the nominal prize after 20 years. Of course, in the rare event that you should get the choice, you're better off taking the prize up front: then you can also invest it at higher returns than the state is willing to give you.

Howard Mark

Dear Dr. Schmidt,

In contemplating the Mach-Zender interferometer diagram in John Cramer's Alternate View article (June 2000), I was struck with the possibility of yet another alternate view: Rather than single photons being split into two equal parts (a dubious proposition), we might consider that a phalanx of photons emitted from a source, would always have half

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

its number split away to travel along the upper arm, while the other half travels along the lower arm, regardless of whether or not an opaque blocker is placed in the lower arm. The photons in the lower arm would, of course, get absorbed by any blocker so placed. This would produce exactly the same detection distribution percentages quoted in the article. With a blocker in place, only half of the light beam arrives at the second beam-splitter, and of that, half goes to detector D_1, while the other half goes to D_2. The result is a 25s detection at each of D_1 and D_2. 50s has been absorbed by the blocker.

I suspect that the experiments described in the Article are not done with single photons, but are aggregate percentages of multitudinous "hits" at the various detectors. If that is so, my interpretation is just as valid as imagining a single photon producing those results. In the single-photon scenario, a photon enters the interferometer and is split into two parts, each part traveling along one arm of the device. If a blocker is placed along the lower arm, the photon somehow knows this in advance, refuses to be split, and chooses to travel along one arm or the other with its corpus intact.

It is far likelier that a single photon, not susceptible to partition, at least for the purpose at hand, would have a 50/50 chance of being routed along one arm or the other. No wave interference could ever occur because there would be only one active conduit. This would mean that the arrival of a photon at D_2, as a single event, could never guarantee that a blocker was present. The guarantee would come only statistically, as when D_1 and D_2 each receive only 25% of the beamed photons.

In the real-world situation, where many photons are beamed into an interferometer simultaniously, things would be much as Mr. Cramer describes, since the necessary interference would be present. Imaging would, and apparently does occur, but the explanation should belong to classical physics. Instead of "interaction-free" quantum measuring and imaging, the experimenters might merely have developed an interferometric imaging tool—no "quantum spookiness" involved.

Raymond Graudis

Dear Stan,

Raymond Graudis has missed the point of my Alternate View column about interaction free measurements (*Analog*, June-2000).

Can we arrange to emit photons one at a time? The answer is *yes*. It's not easy because it involves very low light intensities, but it is done routinely in experiments involving quantum optics. And at higher light intensities we can achieve the same effect more efficiently by ignoring multiphoton events and selecting those in which only a single photon was involved. Both approaches give the same results.

The point of the work described in my column is that *if we do* arrange to emit only a single photon, we have a certain probability of detecting the presence of an object, even when *no* photon has interacted with that object. In the original Elitzur-Vaidmann experiment that probability is 33%. In Paul Kwiat's Xeno improvement it can be made arbitrarily close to 100%, depending only on the number of trips the photon makes around the optical racetrack.

I think that this result easily qualifies as weird and amazing. With quantum effects we can obtain information about the presence of an object, and even construct a silhouette image of the object, without a single photon having interacted with it! We require only the *possibility* of a photon interaction. Classical physics offers no equivalent process.

It's clear that if certain detection probabilities apply to a measurements with a single photon, they must also apply to measurements involving many photons.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

How could it be otherwise? And certainly, if one blasts the system with a large number of photons at once, as Mr. Graudis suggests, some of these will end up interacting with the object. But that is not an interesting result. It's just what one would expect.

John G. Cramer

In this month's [June 2000] Brass Tacks, Stan Schmidt answers a reader's letter by stating that (the year) 2000 is the last year of the first millenium. Regarding the nonmillennialness of 2000, I agree technically, that the number is important enough to be 'millennial' but it's either the end of the second millennium (or the start of the third) for the same reason that the century whose years began with 19 (with the exception of 1900, technically) wasn't called the 19th century...

OK, it's an item as picky as the 2000-2001 controversy, but the first millennium was a long time ago . . .

P. J. O'Connor

Oops! Sorry about that—and I hope it's obvious that this one was a simple typo, not a fundamental misunderstanding.

Dear Mr Schmidt, et al,

As a longtime *Analog* reader, I was greatly tickled, albeit cynically, by Sean McMullen's short story "Unthinkable." I have seen several of the stories and articles published following the same theme in your and other magazines, that the US space program allows no room for original design or thought. The hidebound, overblown approach which has developed between NASA and US politicians makes the concept in Mr. McMullen's story inevitable.

It is my sincere hope that the daring explorer willing to fight for the chance to reach a neighboring planet efficiently is an American; however, history shows that it has been the driven, the desperate, and the avaricious who have dared to sail the edge of the world. While it is easy to understand that giving engineers free rein to blow up prototypes, or send an adventurous pilot to their death, would be crazy, sometimes things are crazy enough to work, and sometimes they only seem crazy to the entrenched. Has America truly lost that spirit of exploration? Perhaps it would be preferable to have a truly worldwide attempt at interplanetary travel as Mr. McMullen describes. It may serve to help unite the troubled planet. But all I can finally say is: go get 'em!

Robert Volk
Syracuse, NY

Reference June 2000 Brass Tacks, first letter. I believe that *Analog* in 1968 or 1969 had a story where computer-generated images replaced live actors and were indistinquishable from the real thing. Part of the basis for the time range is I recollect showing the story to a professor. I believe part of the story dealt with the price of computing declining.

H L Stuck

Actually, I've since been reminded that Robert A. Heinlein did it even earlier, though in a different context, in The Moon Is a Harsh Mistress *(1966).*■

Kelvin Throop's General Theory of Relativity:
The future has already happened every place except where you are.

Kelvin Throop's Special Theory of Relativity:
Nothing has really happened until I've heard about it.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

CLASSIFIED MARKETPLACE

Advertise in the world's leading science fiction magazines with our Analog/Asimov's combined classified section. Ad rates per issue: $2.95 per word (10 word minimum), $125 per column inch (2.25 inch maximum). SPECIAL INTRODUCTORY OFFER: Buy two issues and receive a third issue FREE. Send orders to: Dell Magazines, Classified Department, 475 Park Ave. S., 11th Floor, New York, NY 10016. Direct inquires to: (212) 686-7188; Fax (212) 686-7414.

BOOKS/PUBLICATIONS

BUYING SCIENCE FICTION magazines, book collections. Will travel for large accumulations. Bowman, Box 167, Carmel, IN 46082.

BOOKS/PUBLICATIONS

PUBLISH YOUR BOOK ONLINE, Third Millennium Publishing, a cooperative of online writers and resources, http://3mpub.com

THE SPECIAL SCIENCE FICTION COMBINATION FREE AD OFFER

RATES: **Regular Classifieds** **$2.95 per word**
Classified Display **$125 per column inch**

Free Ad Offer Order Form

(check one) ☐ 2 months plus 3rd month **FREE** ☐ 4 months plus 2 months **FREE**

Enclosed is my ad copy: _____ words or _____ inches

Payment: ☐ Check ☐ Money order ☐ MasterCard ☐ VISA

Amount Enclosed _____ Amount Charged _____

Credit Card # |_|_|_|_|-|_|_|_|_|-|_|_|_|_|-|_|_|_|_|

Exp. date _____ / _____

Cardholder Signature _____

Phone No. _____

Name _____

Address: _____

City _____ State _____ Zip _____

DELL MAGAZINES

Classified Department, 475 Park Avenue South, 11th Floor, New York, NY 10016
For assistance call: (212) 686-7188 • FAX: (212) 686-7414

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

UPCOMING EVENTS Anthony Lewis

25 December 2000
POLECON MM (High Arctic SF conference). This is the last in this series of conferences because the world is coming to an end one week after it occurs. Guest of Honor—Gaia, Official Artist—John "Jack" Frost. Registration—free to good little girls and boys—we know who you are! Info: don't write to us; we'll write to you.

---

27 - 31 December 2000
ARMAGEDDONCON (Israel SF conference) at Jerusalem, Israel. Theme: Armageddon, including an End-of-the-World ball on Mount Megiddo. Guests of Honor—Larry Niven, Joan Vinge, and Paul McAuley. TM—Ian Watson. Join by 20 November and nominate for the Armageddon Award for best apocalyptic novel, novella, and short story. To be eligible, works must have been published since 1000 C.E. Registration—about US$140 or NIS 550. Info: con@sf-f.org.il URL: http://armageddoncon.org. [this is a real convention]

---

29 December 2000 - 1 January 2001
HOGMANAYCON (Scots SF conference) at Central Hotel, Glasgow, Scotland. Guests:—Spider & Jeanne Robinson, Sydney Jordan, Archie Roy, Vince Docherty, Oscar Schwigelhofer. Info: Hogmanaycon, c/o 26 Avonbank Road, Rutherglen, Glasgow G73 2PA, Scotland e-mail: john@gelsalba.demon.co.uk; URL: www.hogmanaycon.org.uk

---

30 August - 3 September 2001
MILLENNIUM PHILCON (59th World Science Fiction Convention) at Philadelphia Marriott, Philadelphia, Penna. Guests of Honor—Greg Bear, Stephen Youll, Gardner Dozois, George Scithers, TM—Esther Friesner. Registration—$145 [rates may go up]; supporting $40. [These are the latest rates posted on the Internet as of the time this column went to press.] This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition—the works. Info: Philcon, Box 310, Huntingdon Valley, PA 19006. email: philcon2001@netaxs.com URL: http://www.netaxs.com/~phil2001.

---

26 - 29 October 2001
WORLD FANTASY CONVENTION 27 at Omni Bayfront, Corpus Christi, Tex. Guests of Honor—K. W. Jeter, John Crowley; TM—Joe Lansdale. Registration—$105 until 15 October 2000, then more. Info: WFC 2000, Box 27277, Austin, TX 78755. +1.512.835.9304 (voice), +1.512.835.7637 (fax), email: fduartejr@aol.com URL:http://2000.worldfantasy.org

---

Convention attenders: When calling conventions for information—do not call collect and do not call too late in the evening. It is best to include a S.A.S.E. when requesting information; include an IRC if the convention is in a different country. ■

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

SOME PEOPLE WOULD KILL...FOR A COPY

But you don't need to! Subscribe to Alfred Hitchcock's Mystery Magazine and you won't miss a single issue of all the mystery and intrigue you love. Each year you'll enjoy 10 issues of 144 pages and one double issue of more than 240 pages delivered directly to you door.

Act now and take advantage of this special introductory offer,
6 issues for just $9.97!
Enjoy the convenience of home delivery and save!

To order by charge card, call toll-free:
1-800-333-3311
Outside the U.S.A.: 303-678-0439

BY MAIL

Alfred Hitchcock • P.O. Box 54011
Boulder, CO 80322-4011

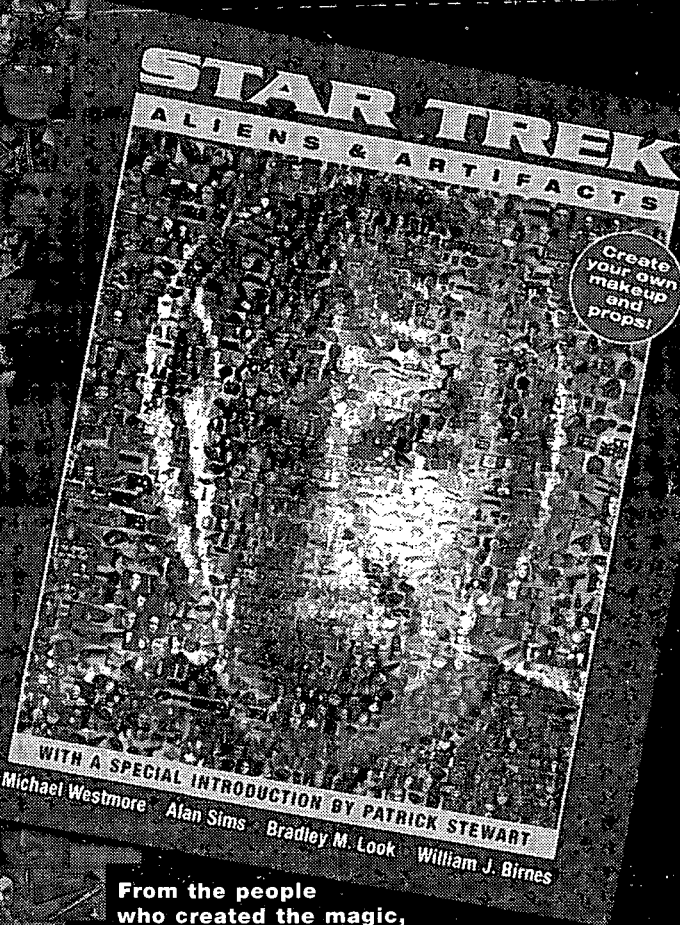
Please allow 4 to 6 weeks for delivery of your first issue. Outside USA: Add $4 per year for shipping and handling. All orders must be paid in U.S. funds.
*We publish a double issue once a year which counts as two issues toward your subscription.

5P21

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

THE SECRET IS OUT

THE MYSTERIES BEHIND STAR TREK®'S DAZZLING MAKEUP AND PROPS ARE FINALLY REVEALED!


STAR TREK®
ALIENS & ARTIFACTS
Create your own makeup and props!
WITH A SPECIAL INTRODUCTION BY PATRICK STEWART
Michael Westmore · Alan Sims · Bradley M. Look · William J. Birnes

From the people who created the magic, discover how *Star Trek*'s award-winning makeup artists and craftspeople use their talents and innovation to transform the galaxy's wildest ideas into incredible realities!

A Star Trek Books Trade Paperback
Published by Pocket Books
A VIACOM COMPANY

Visit www.SimonSays.com/st and www.StarTrek.com
Available wherever books are sold

™, ®, & ©2000 Paramount Pictures. All rights reserved.
STAR TREK and related marks are trademarks of Paramount Pictures. Pocket Books Authorized User.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED